Railway Age Gazette

PUBLISHED EVERY FRIDAY AND DAILY EIGHT TIMES IN JUNE BY THE
SIMMONS-BOARDMAN PUBLISHING COMPANY
WOOLWORTH BUILDING, NEW YORK.

CHICAGO: Transportation Bldg. CLEVELAND: Citizens' Bldg.
LONDON: Queen Anne's Chambers, Westminster.

E. A. SIMMONS, *President.*
L. B. SHERMAN, *Vice-President.* HENRY LEE, *Sec'y & Treas.*
The address of the company is the address of the officers.

EDITORS
SAMUEL O. DUNN, *Editor.*
ROY V. WRIGHT, *Managing Editor.*

W. E. HOOPER	H. F. LANE	W. S. LACHER
B. B. ADAMS	R. E. THAYER	C. W. FOSS
E. T. HOWSON	A. C. LOUDON	F. W. KRAEGER
H. H. SIMMONS	C. B. PECK	J. M. RUTHERFORD

Subscriptions, including 52 regular weekly issues and special daily editions published from time to time in New York, or in places other than New York, payable in advance and postage free:

United States and Mexico..... **$5.00**
Canada **6.00**
Foreign Countries (excepting daily editions)..... **8.00**
Single Copies .....**15 cents each**

Engineering and Maintenance of Way Edition and four Maintenance of Way Convention daily issues, North America, $1; foreign, $2.

Entered at the Post Office at New York, N. Y., as mail matter of the second class.

WE GUARANTEE, that of this issue (the monthly Engineering and Maintenance Edition) 10,850 copies were printed; that of these 10,850 copies 7,370 were mailed to regular paid subscribers to the weekly edition, 1,861 to subscribers who get the Engineering and Maintenance Edition only, 172 were provided for counter and news companies' sales, 976 were mailed to advertisers, exchanges and correspondents, and 471 were provided for new subscriptions, samples, copies lost in the mail and office use; that the total copies printed this year to date were 314,500, an average of 9,250 copes a week.

The RAILWAY AGE GAZETTE and all other Simmons-Boardman publications are members of the Audit Bureau of Circulations.

VOLUME 59 AUGUST 20, 1915 No. 8

Contents

EDITORIAL:
Editorial Notes 307
Western Rate Decision 308
"D—d if They Do and D—d if They Don't..... 309
*Buffalo, Rochester & Pittsburgh 310

NEW BOOKS 311

LETTERS TO THE EDITOR:
Depreciation and Confiscation; by Alex. C. Humphreys..... 311

MISCELLANEOUS:
Reductions Ordered in Rates on Anthracite Coal..... 313
*Lateral Stresses on Rails in Curved Tracks..... 319
The Interstate Commerce Commission's Report on Rock Island..... 323
Report on Thurmont Collision 327
*Automatic Block Signals for Gauntlet in Miraflores Tunnel..... 327
Train Accidents in July 328
*Turning French Freight Cars Into Hospitals; by W. S. Hiatt..... 329
*Rolled Steel Truck Frames..... 331
*Passenger Car Roof Construction..... 332

MAINTENANCE OF WAY SECTION

EDITORIAL:
Editorial Notes 333
Tools for Maintenance of Way Employees..... 334
The Use of Liquor in Maintenance Camps..... 334

NEW BOOKS 334

LETTERS TO THE EDITOR:
The Inclination of the Rail in Economic Railroad Practice; by John Lundie 335

MISCELLANEOUS:
*The Tool Equipment for Maintenance of Way Forces..... 337
Designing Manganese Steel Track Work; by V. Angerer..... 341
*The Chattanooga Creek Bridge of the N., C. & St. L.; by C. H. Johnson 343
*Portable Gravel Screening and Washing Plant; by MacRae D. Campbell 345
*The Annual Cost of Ties; by J. G. Sullivan..... 352
*Laying Rails with Locomotive Cranes on the Lehigh Valley..... 353
*Digging Track Ditches; by Kenneth L. Van Auken..... 355
Abstract of Engineering Articles 356

GENERAL NEWS SECTION 357

*Illustrated.

Lateral Stresses in Rails on Curves

The experiments on lateral thrusts on rails on curves, described by George L. Fowler on another page, are interesting and to a certain extent instructive; but as stated by Mr. Fowler, it is impossible to draw accurate conclusions from them. In the first place, the curves on which the tests were made were too short—215 ft. in one case, and 237 ft. in the other. The test instruments were so placed on the curves that they were only about 125 ft. from the ends. Under these conditions, there is a question as to whether the wheels or trucks were exerting a normal amount of pressure on the rail at the time they passed over the recording instrument. In the next place in plotting the curves showing the average thrust for different speeds, the median lines were roughly drawn, and while they would appear to approximate parabolic curves, no pretense was made at determining their exact shape with mathematical accuracy; in fact, an insufficient number of experiments were made in each case to warrant so doing. In studying the results of the tests, it should be remembered therefore, that "the records cannot be taken as comprehensive enough to base a final conclusion on, but their general trend is sufficiently consistent to indicate a probability.

Hospital Cars in France

Elsewhere in this issue there is an article by Walter S. Hiatt, Special Correspondent for the *Railway Age Gazette* in France, describing handling of the wounded from the front to the permanent hospitals of the country. The magnitude of the business of transporting wounded soldiers is fearfully impressive when one thinks of 600 carloads of wounded men sent back each day. It brings quite vividly to mind one phase of the horror of the European war. In sending the article printed elsewhere, Mr. Hiatt suggests that some of the railroad men of America might like to contribute toward the rebuilding of one or more of the freight cars into hospital cars. Commandant E. Loiseleur, who is in charge of the rebuilding of these cars, will see that if money for a car or cars is contributed by American railroad men, a plate will be placed on the car stating from whom the money came. The suggestion is worth considering. One or more of these cars in service would form a fitting tribute of American railroad men to the resourcefulness and good work of the French railroads in this war. Such tribute would be in the nature of contribution to Red Cross work and not an act of partisanship. As Mr. Hiatt points out, the cars cost less than $250 to rebuild. Money should be sent to Commandant E. Loiseleur, Fourth Bureau, Fourth Division, Ministere de la Guerre, Boulevard St. Germain, Paris, France.

The Missouri Pacific Receivership

The voluntary reorganization of the finances of the Missouri-Pacific has proved impracticable and on August 17 the company was put into the hands of the receiver. B. F. Bush, president, was appointed sole receiver by the court. A plan of readjustment which called for an assessment of $50 per $100 share on the stock and the exchange of various issues of bonds for preferred stock and bonds was announced by Kuhn, Loeb & Company and associates on July 1, and deposits of security were asked under this plan. August 17 was the last day for deposits, but presumably if there had been any at all satisfactory response from security holders previous to August 17 the date for deposits would have been extended. The board of directors, however, in announcing the receivership, say that "the deposits of securities are wholly insufficient." Kuhn, Loeb & Company and various protective committees representing different issues of securities announce that a reorganization will take place along the same lines as had been proposed for the voluntary reorganization. An attempt to get the co-operation and consent of so many conflicting interests and to secure sacrifices so drastic (at least

on paper) had never been made before in the history of American railroad companies. Although there were very numerous individual complaints against numerous provisions of the plan of reorganization, the failure of a sufficient number of security holders to make the required deposits does not necessarily cast any reflection on the merits of the reorganization plan. It may and probably does simply reflect the extreme difficulties of the case, and the quite natural attitude of each class of security holders to put up the strongest possible fight for their own individual interests and to distrust the co-operation and sacrifices made by other classes of security holders.

Light Reading in the Court News

If any reader should complain of the levity of our court news column now and then, we should hardly be ready to disprove the charge, especially if he should cite a decision like that reported from Mississippi last week (page 298). Courts are always dignified, but of the exceedingly frivolous matters which they are often obliged to listen to, the railroad law column seems always to have its full share. In this Mississippi case the judge seems to have bethought himself that his decision would probably reach the reader in the summer, when light reading is in order, and his reference to "white gentlemen with pockets full of hundred dollar bills," shows a delicate appreciation of all sides of the question at issue. The only legitimate criticism that the editor can admit is that he failed to put the article in the humorous column. In speaking of the frivolousness of damage suits we refer, of course, to the impression on the readers. Every law suit is intensely serious to somebody. In this case the serious side, to the railroad man, is entirely ignored in the decision, as reported. The serious side is that the ticket agent, who could not change the hundred-dollar bill, in all probability would have averted the law suit if he had opened his office ten or fifteen minutes earlier, as he ought to have done; and the conductor, who ejected the passenger, would also have averted it if he had taken the passenger's word that he had tried to buy a ticket. It would not be fair to condemn the conductor at this distance, and it is true that the question when to stretch the regulations is a delicate one, very difficult to provide for in advance. Nevertheless, discreet employees who do go outside of their instructions now and then, often thereby smooth the relations between their employer and the public in a way to deserve praise. At all events, we have here the lesson that a very small irregularity can make troublesome and often costly litigation.

The Passenger Trainman's Police Function

The railroad policeman is, probably, very much like the average policeman in other service, in that he is subject to the insidious weakness which in ordinary concerns, where there is little excitement and apparently no great matter at stake, causes him to follow the line of least resistance. The Court News column this week contains an illustration, from Massachusetts, of how a conductor and a brakeman failed in their duty, compelling their employer to pay damages to a passenger who was assaulted by another passenger. The conductor and the brakeman were police officers, but failed to realize their responsibilities as such. Passenger trainmen must be affable to pleasant passengers and severe with those who deserve restraint, rebuke or punishment. This is a difficult dual role, and it is not to be wondered at that many trainmen fail to measure up to its requirements. It sometimes looks as though it would be a good idea to have the rough, energetic and ugly conductor give courses of instruction to those who are lazy or too mild. Drill and discussion are the only means by which conductors generally can be educated in this matter, for actual practice is too intermittent and irregular to be depended on. It is very desirable for the trainman to cultivate an aggressive habit of mind without reference to his duties in connection with law-breakers. Most of the time, it is true, he must be cultivating gentility; but that does not mean that this suggestion is out of place. Indeed, the efficient passenger trainman must exercise these opposite qualities every day. On many trains there are enough thoughtless passengers who occupy two seats while women with children walk through three cars to find one seat, to occupy profitabbly the attention of several brakemen at every large station. It may be questionable whether a railway can afford thus to educate boorish passengers, for the task is a big one; but there is no question that the brakeman, well trained in all his duties, who voluntarily cultivates the iron hand for law-breakers—even petty law-breakers—is a valuable member of society.

WESTERN FREIGHT RATE DECISION

THE decision of the majority of the Interstate Commerce Commission in the western freight rate advance case is disappointing to the carriers and surprising to most people who followed the hearings closely. It is disappointing to the carriers because the advances granted are only a minor part of those asked for and so small that they will do practically no good. Some newspapers, desirous of stimulating prosperity by artificial respiration, have estimated the advances at $4,000,000 a year. "The aggregate increase of revenue permitted under the majority report," says Commissioner Daniels, who heard the case, "will hardly exceed $1,600,000, or about one-fourth of 1 per cent of the total freight revenue of these carriers for 1914." This is the estimate made independently by representatives of the railways and is undoubtedly correct.

The decision caused so much surprise because most people who followed the hearings thought the roads made out their case. Repeated careful readings of the majority opinion itself tends to confirm this view. The facts accepted and presented sustain almost every contention made by the representatives of the railways. It is significant that Commissioner Daniels, who knows the record better than any one else, attacks the decision of the majority as unsupported by facts, logic or justice. It is almost unprecedented for the commission to make a decision so exactly opposite to that favored by one of its own members who heard the case.

The western railways based their claims mainly on the grounds that they needed larger earnings and that the specific proposed advanced rates were reasonable. Upon the first point they introduced evidence showing that their operating expenses had been rapidly increasing, both absolutely and relatively, to their total earnings and that in consequence their net operating income and the return on their capitalization and property investment had been declining. Those who opposed the advances sought to show that the increasing ratio of operating expenses to earnings was more nominal than real, being due to changes in accounting methods required by the commission in 1907. The majority of the commission definitely rules that the increases in the operating ratio have been due to actual increases in operating expenses. Those who opposed the advances also claimed that the increases in expenses of some of the roads were due largely to financial mismanagement. The majority explicitly finds that there is no apparent connection between the increases in the operating ratio and the financial mismanagement of certain roads. It finds also that there has been a large increase in the ratio of the bonds to stocks outstanding, and that this is due to an increasing reluctance on the part of the public to risk investment in railway stocks.

But while it makes these and other similar findings, the majority refrains for some reason from making any finding as to whether the net returns of the roads are inadequate. As Commissioner Daniels points out, the eastern lines made no clearer demonstration in the five per cent. case of the inadequacy of their revenues, and yet in that case the commission specifically held that they were insufficient from the standpoint of the public welfare.

There are several roads in western territory which recently have been under attack for financial mismanagement. But the commission explicitly recognizes the fact that all the roads in a

group should not be judged either by the strongest or the weakest, the best managed or the worst managed, but that it should consider the situation as a whole. Nevertheless, in view of the hiatus between the facts which it presents and the decision it reaches, there seems ground for the suspicion that it was unduly influenced by the disclosures which have been made in some other proceedings.

When Commisisoner Daniels says that such cases as this should be "neither prejudiced nor complicated by considerations of individual instances of corporate mismanagement," he is plainly implying that this is just what the majority has done. The blame for the outcome, so far as it is due to this cause, cannot all be put on the commission. A large part of it should be placed on the management of the roads that have brought railways in general into bad odor. But two wrongs do not make a right. The commission has no moral or legal authority to base its decisions in rate cases on prejudiced or punitive considerations. It has no right to punish all roads for the shortcomings of a part.

The second important point involved was the reasonableness of the proposed advanced rates. In its opinion in the five per cent case the commission intimated that it did not look with favor on general advances. The tariffs, it indicated, were full of inconsistencies and discriminations, and the carriers should first secure increases in revenues by advancing the rates which were relatively low. The western lines sought to do this. The four principal commodities on which advances were proposed were grain and grain products, live stock, packing house products and coal. The majority of the commission refused the advances on all these but coal.

It refused the increase on live stock on the ground that above half of the traffic now moves on state rates and that many state rates are lower than the present and proposed interstate rates. Commissioner Daniels shows it is not a fact that so large a part of the traffic moves on the state rates. He also contends that the commission should not have refused advance in interstate rates because there were lower state rates. The attitude adopted by the majority is illogical and disappointing. The Federal authority over commerce is paramount. It would seem, therefore, that the reasonable and proper thing for the commission to do, where it finds state rates are lower than interstate rates, is to determine which are reasonable and then bring them into harmony. For it to refuse reasonable advances in interstate rates because there are lower state rates, is to let state regulation control interstate regulation. If the Federal commission is to begin to refuse advances in interstate rates because of low state rates, and the state commissions are to refuse advances in state rates because of interstate rates that do not suit them, the situation of the railways is indeed an unhappy one. The attitude assumed by the majority of the commission is lacking in fairness and courage and contrasts strongly with its opinion in the Shreveport case. As to the rates on packing house products, these have been notoriously low in proportion to the value and cost of the service rendered for years. The decision of the commission against advances in them is almost inexplicable. However, certain of the railways have themselves afforded some ground for refusing advances by keeping in effect between Kansas City and Chicago certain packing house products rates that are unremunerative and discriminatory.

The worst feature about the decision is its negative character. Nothing has so blighting an effect on the management of a business concern as to have at its head a man who has no constructive program or policies of his own and who vetoes most of those suggested by his subordinates. This is very much the situation in which the railways find themselves. The Interstate Commerce Commission is in an important sense at their head. When their eastern lines asked for a horizontal increase in freight rates it conceded they needed larger revenues. In its first decision in the five per cent case, however, it gave them only a small part of the advances they asked and told them to get the rest of the needed revenues by imposing special charges for special service at terminals, advancing low rates on specific commodities and raising passenger rates. The railways, east and west, filed tariffs fixing special rates for special services. The commission promptly suspended and soon annulled them. They advanced their passenger rates. The commission let the advances go into effect in the east, but suspended them in the west. The western lines proposed advances in the low rates on certain specific commodities. The commission suspended them and now has annulled most of them. By permitting some freight rate advances to be made and by its discussion of the financial condition of the western lines, the commission seems to admit that the western lines need larger revenues. But it does not explicitly concede this, and nowhere does it give the roads any hint as to how they should proceed to get additional revenues.

The decision, as Commissioner Daniels says in his dissenting opinion, "only beclouds the principles upon which the commission may be expected to act in future and leaves nothing certain but uncertainty." As he adds, a point has been reached where "one of two courses ought deliberately to be chosen and clearly announced. If, despite increased costs not offset by increased revenue, increases in rates are to be denied, except where in individual instances gross injustice would be occasioned by their denial, the carriers ought to be apprised of this policy, so that they may set their house in order, if they can, against such a situation. If, on the other hand, we are to acknowledge in general, what we are perforce compelled to admit in detail, just and reasonable increased rates should be permitted not grudgingly but with such fair measure of allowance as will indicate that the transportation industry is entitled in the interest of the public to earnings sufficient to provide a service commensurate with public needs." The course the commission has thus far followed regarding advances in rates has been illogical, inconsistent and vacillating.

"D—d IF THEY DO AND D—d IF THEY DON'T"

WHAT everybody expected would happen is happening—in Texas. It is a mild statement that a Dallas paper makes in saying that the railroads "occupy rather an awkward position." The environments of the position are the Interstate Commerce Commission, the Louisiana Railroad Commission and the Texas Railroad Commission. The bone of contention is the advantage claimed to have been given to Shreveport, La., over inland Texas jobbing points by a supplemental order of the Interstate Commerce Commission, which defines East Texas. The western limits have been set at a line drawn through Gainesville, Fort Worth, Waco and down the Brazos river to the gulf. Within that territory the railroads are ordered to put in rates from Texas points toward Shreveport that shall be uniform with rates from Shreveport for like distances. The railroads are expected to comply with this order by September 15.

Now come in the devil and the deep sea. Rates between Texas points are fixed by the Texas commission. The rates required by the Interstate Commerce Commission are under an order authorized by the Supreme Court of the United States. The first proceeding by which the situation was brought about was instituted by the Louisiana commission. The railroads are the goat. They have been brought into a controversy in which they have little interest except to know whether it will be better to obey the law of the state or of the United States. It has been suggested that Congress might take some action that would settle controversies between the commissions of two states or between a state commission and the Interstate Commerce Commission, and not allow all the punishment to fall upon the innocent bystander who is being robbed at the same time, but Congress has not done so.

It has been intimated by one of the Texas commissioners that he will ask the attorney-general of the state to bring an injunction suit against the carriers if they attempt to apply the rates required by the order of the federal commission. The railroads are left in a position where they have to guess which one of

the commissions will triumph and risk a penalty for guessing whether the guess is right or wrong. The Dallas News hits the mark in saying: "The mistake of the state railroad commission was in standing back on its dignity and muttering the litany of state's rights when it ought to have been engaged in showing that the discrimination complained of by Shreveport was one more of appearance than reality." In a way the railways should welcome the struggle between the state and federal commissions, for it is another step toward a final settlement of the question as to what authority is finally to be their master.

BUFFALO, ROCHESTER & PITTSBURGH

AT one time almost exclusively a coal road, the Buffalo, Rochester & Pittsburgh, under its present management, has been developed into an all-around profitable railroad, doing a large passenger business and general freight business, as well as being a carrier of coal and coke. Being an independent north and south road, serving Pittsburgh and the territory north to Lake Ontario, it has been necessary to maintain earning power through the development of economies and the utilization of modern methods of railroading, freight rates per ton per mile having shown a steady decline, and passenger service a steady increase in cost, due to more exacting demands of the public.

Since a considerable part of the coal traffic moves from the neighborhood of Vintondale and nearby branches over almost the entire length of the road north to Buffalo or Rochester, it was obvious that one of the surest methods of effecting economies in operation would be the development of a south-bound traffic which could be carried in coal cars, and it was through the efforts of the present management that a company was induced to locate an iron furnace on the southern part of the road. The development of an iron ore traffic south at once greatly improved the average train load of revenue freight.

A railroad doing a competitive passenger business, the train mileage of which amounted in 1915 to 1,343,611 miles, as compared with the revenue freight train mileage of 2,344,000 miles and with an average ton mile rate of only 0.477 cents, must of necessity operate economically to show a profit, and especially is this true with a road having as heavy and numerous grades as has the Buffalo, Rochester & Pittsburgh.

The year ended June 30, 1915, was in a way a test applied to the work of development, which has been carried on by the management. Military strategists say that a retreat is a far more severe criterion of generalship than a victorious advance. This is in some measure equally true of the operation of a railroad in a time of business depression and falling off of traffic. What makes the Buffalo, Rochester & Pittsburgh's 1915 year peculiarly interesting is that the falling off of ore traffic was in much greater proportion than the falling off in bituminous coal traffic. The total tonnage of freight carried in 1915 was 10,928,000; in 1914, 12,295,000. The bituminous coal tonnage in 1915 was 7,108,000, or 1,069,000 less than in 1914, and the tonnage of iron ore was 417,000 in 1915, or 283,000 tons less than in 1914.

In 1914 and the first part of 1915, very considerable additions had been made to the engines in the service, and the new engines put into freight service were mostly Mallets, Mikados having previously been the heaviest locomotives used.

It is only necessary to reflect that if two train loads of coal of 50 cars each are sent north 100 miles, and the 100 cars have to be sent south empty, even if combined into one train, the average train load is about 1,700 tons, whereas if 50 of the coal cars can be loaded south-bound, even if the empties and loads are sent south in two trains, the average train load is about 1,900 tons, to see what the Buffalo, Rochester & Pittsburgh was brought up against with the falling off of 40 per cent. in ore tonnage as compared with 10 per cent. in coal tonnage. The purchase of heavier locomotives, however, had apparently come in the very nick of time. The average revenue freight train load in 1915 was 707 tons, as against 694 tons in 1914, and the average load of revenue freight per engine mile was 477 tons, the highest in the history of the road, comparing with 454 tons in 1914 and 463 tons in 1913, the best previous record. Transportation expenses in 1915 amounted to $3,145,000, as compared with $3,880,000 in the previous year, a decrease of 18.96 per cent. A striking and significant saving was made in the cost of fuel for train locomotives. This was $473,000 in 1915, as against $773,000 in 1914, a decrease of 39 per cent., as against a decrease of 14 per cent. in total train mileage. The total operating expenses amounted to $6,935,000 in 1915, as compared with $7,965,000 in 1914, a decrease of 12.93 per cent.

The following table shows the ratio of each class of expenses to total operating revenues in 1915 and 1914:

	1915.	1914.
Maintenance of way	13.37	13.49
Maintenance of equipment	22.53	20.65
Traffic	1.50	1.40
Transportation	33.17	36.15
Miscellaneous	0.15	0.25
General	2.44	2.26

In commenting on the annual report of the Buffalo, Rochester & Pittsburgh for 1914, it was pointed out that the adoption of very heavy power was made only after the completion of a far-sighted and scientific strengthening of the entire permanent property and especially of those parts of the road on which the heavy locomotives were to be placed. The opinion was expressed that the result of such a scientific development would be clearly reflected in materially greater effectiveness of the plan. The showing made in 1915 confirms this opinion fully as conclusively as would a great gain made in net profits in a year of increased traffic and large ore shipments.

The Buffalo, Rochester & Pittsburgh

crease in expenses previously mentioned amounting to $1,030,000, leaving a net revenue in 1915 of $2,545,000, which was less than the 1914 net by $225,000. There was a decrease also in non-operating income, due principally to the fact that the credit balance for hire of freight cars was less by $115,000 than in the previous year, so that the net income available for dividends amounted to $913,000, as against $1,355,000 in the previous year. From this was appropriated in 1915 $22,000 for pension and fire insurance, and $111,000 principally for the payment of equipment trust and $780,000 for dividends, being 6 per cent. on the $6,000,000 preferred stock, and 4 per cent. on the $10,500,000 common stock. In 1914 6 per cent. was paid on both the common and the preferred, calling for $990,000, and a larger appropriation, $348,000, was made for payment of equipment trust, etc.

The total current assets at the end of 1915 amounted to $3,547,000, of which $1,409,000 was cash and demand loans and deposits. The current liabilities amounted to $1,245,000, with only a nominal amount of loans and bills payable, $9,600.

Apparently a return to normal business conditions with a resumption of iron ore shipments would, barring some unforeseeable great increase in operating expenses, not only restore the earning power of 1913, when a substantial margin was earned over 6 per cent. dividends on the common, but give the company an even greater margin of safety. This fact, it might incidentally be mentioned, is wholly due to the foresight and good judgment of the management of the property, since the Interstate Commerce Commission 5 per cent. rate advance affected the Buffalo, Rochester & Pittsburgh to only a very small extent, the increase not applying on coal, coke or iron ore. President Noonan in his report says that "A careful estimate indicates that such increases (those granted by the Interstate Commerce Commission) added about $41,000 to our revenues this year."

The following table shows the principal figures for operation in 1915, as compared with 1914:

	1915.	1914.
Average mileage operated	586	586
Coal freight revenue	$5,040,101	$5,904,106
Coke freight revenue	318,638	338,339
Merchandise freight revenue	2,663,951	2,911,497
Passenger revenue	1,101,981	1,184,417
Total operating revenues	9,479,936	10,734,691
Maintenance of way and structures	1,267,253	1,447,954
Maintenance of equipment	2,135,354	2,216,194
Traffic	141,767	150,553
Transportation	3,144,598	3,880,160
Miscellaneous operations	14,658	27,054
General expenses	231,621	243,202
Total operating expenses	6,935,252	7,965,117
Taxes	230,000	234,000
Uncollectible revenues	596	.....
Operating income	2,314,087	2,535,574
Gross income	3,032,733	3,355,798
Net income	912,720	1,354,784
Appropriations	132,720	364,784
Dividends	780,000	999,000

NEW BOOKS

Oxy-Acetylene Welding and Cutting. By Calvin F. Swingle, M.E. 190 pages, 4½ in. by 6½ in. Illustrated. Bound in leather or cloth. Published by Frederick J. Drake & Co., Chicago. Price, $1.50 in leather; $1.00 in cloth.

This book is intended as a practical treatise on the subject of welding and cutting with the oxy-acetylene flame, and only so much of the theory pertaining to the subject has been included as will enable the practical man to acquire a thorough working understanding of the subject. After an introductory chapter dealing briefly with the adaptability of various methods of welding, several chapters are devoted to welding flames and the properties and methods of handling the gases most commonly used. This portion of the book is confined largely to the oxy-acetylene flame, which has the widest practical application, and touches only briefly on other gases which have been used with oxygen to a less extent in welding and cutting operations. The equipment used in welding and cutting is next discussed, after which the operation of the plant and the practices followed in welding and cutting are taken up. A final brief chapter is devoted to the subject of carbon removal with the oxygen torch. The book contains a large number of illustrations and a number of tables.

Letters to the Editor

DEPRECIATION AND CONFISCATION

NEW YORK, N. Y.

To the Editor of the Railway Age Gazette:

Permit me to comment on the article in your issue of June 4—A Billion Dollar Confiscation—by Morrell Walker Gaines, and your editorial in the same issue, and the letter of Lawrence K. Frank, in your issue of July 9.

The subject of depreciation, *so-called,* is of vital importance to-day to the railroads and other public utilities of the country and, therefore, to the people as a whole.

Mr. Gaines' first paragraph in which he condemns the present tendency towards over-regulation of railroads by "powerful Federal and State commissions," in which "counsels of perfection" are substituted for "experience, rough grown from the soil of struggle," is fully justified by the conditions which have developed, especially during the last few years, in answer to public clamor and the activities of honest but incompetent reformers and self-seeking politicians. As has been well said, regulation has degenerated into strangulation.

Mr. Gaines' objections to the present unwieldy, inefficient, costly and unfair scheme for valuing the railroad properties as a basis for rate-making are also fully justified. An additional argument might be advanced against this scheme, which is now costing millions of dollars a year and will in the end, I feel sure, cost more than the $50,000,000 mentioned by Mr. Gaines. The appraisals will be obsolete by the time they are completed.

One radical fault in this system is in deducting for depreciation, *so-called;* not alone for the actual depreciation, but for the proportion of cost indicated by the age of the several parts as compared with the *assumed* expectation of life. That is, the ratio of the present age to the expected life.

This aging of plant calls for a charge for renewals and replacements, but does not call for, nor does it in any way justify a writing down of the fixed capital account.

The income must, if possible, be made to pay for the maintenance of plant, and this renewal or replacement is part of the maintenance. If all parts of the plant were to last only one year and then to be renewed or replaced by an equivalent, the total cost of renewals would fall automatically on each year and be paid for from the year's income. In this case the confounding of cost of renewals with "depreciation" would never have taken root with commissions, courts and others.

Particularly in the case of a new or single unit plant, the accruing liability for the renewal or replacement of its several parts must be carried into the accounts each year, for otherwise the profits will be overstated. This is the justification for an annual charge as an item of expense for deferred, future, or periodic renewals, wrongly styled "depreciation."

It may happen, and does not infrequently happen, in the case of composite properties built up of units of different ages, that the total cost of maintenance, including accruing liability for renewals, is fully met by current expenditures.

This charge to operating expense for future renewals should be credited to reserve, and this reserve should be kept as an open account to be charged for items of renewal and replacement and credited with the annual apportionment, plus the interest on the balance if kept on the sinking fund principle.

It is to be borne in mind constantly that an expectation of life table made up from averages (or said to be) must not be relied upon for individual application. In the case of plant of the same class, even if of standard design and construction, the life of such parts will vary widely according to the character of maintenance and of operation in general. An estimate of accruing liability for renewals and replacements should be held subject to constant amendment and correction as experience indicates in each separate case.

The later rulings of the Interstate Commerce Commission indicate that they are beginning to appreciate some of the practical features of this complicated question.

But we find in the commission's "Classification of Investment in Road and Equipment"—Issue of 1914—effective July 1, 1914, page 32, under the head of, 11. Equipment, the following:

"The ledger value of each unit of equipment shall be credited to the appropriate equipment account when it is retired from service. The amount of this credit shall be concurrently charged as follows:

"The amount of the balance in the balance sheet accrued depreciation account with respect to the equipment thus retired shall be charged to that account; the salvage recovered shall be charged to the materials and supplies account or elsewhere, according to the purpose for which used; the amount of depreciation prior to July 1, 1907, not previously written off or provided for, shall be charged to Profit and Loss, and the remainder shall be charged to the appropriate operating expense account for equipment retired."

That is, so much of the "ledger value" as cannot be located in the "accrued depreciation account" (renewal reserve) and recovered in the parts saved for future sale or service must be charged against income, either past or current.

The question as to the entire cost of renewals being a charge against income depends upon whether, in the early years of the property's life, the income was sufficient to pay all expenses, including cost of maintenance and a fair return on the investment.

A fair study of all the elements involved should be convincing that no such rule should be made retroactive and applied indiscriminately. Here is where, by way of example, the "counsels of perfection" should be tempered by the saving grace of common sense.

Mr. Frank is right so far as he argues for spreading the accruing liability for future renewals over the years of effective service; but he is far from the vital facts of this important question when he speaks of the setting up of a "depreciation reserve" as "a book transaction." The transaction involves fundamental principles; the book-entry is the record only of the transaction. A record may be an entirely accurate statement of an improper transaction. May it not be suggested that a fault to be guarded against on the part of accountants as well as bookkeepers is the placing of the book record above the transaction recorded.

Mr. Frank, in the statement just referred to, says that plant retired should be credited to fixed capital. If it is intended here to refer to such parts only as are permanently retired and not to the parts renewed or replaced by substitutes, then there may be a sufficient reason for the practice proposed. But even in the case of parts thus permanently retired which, for instance, were required to bring into effective action some necessary continuing structure or equipment, the writing off or crediting to fixed capital by no means necessarily is good practice.

To put this in another way—in making a schedule for a valuation, there should be included more than the parts which meet the eye; there should be included and valued the parts which were necessary to bring the plant as a whole into position and condition for effective service.

This brings me to the point which I wish particularly to make in regard to "depreciation" charges as intended to cover only renewals and replacements of active plant.

Because a plant or any of its parts has spent part of its anticipated life, this presents no reason for deducting from plant valuation. The owners are liable for the renewals as they fall due. So long as the renewals are made as required for adequate efficiency of operation, and the renewals are charged against income instead of being capitalized, every legitimate requirement has been met.

Suppose, for instance, that in the case of a composite plant, on the basis of expected life and age the property as a whole has settled down to an 80 per cent. age, and it is assumed that nothing better than this can be maintained, then it is argued that 20 per cent. should be deducted from the valuation on account of "depreciation." If this procedure is enforced by the commission, then they should allow a 20 per cent. item to be included in the estimate of original cost to cover under this ruling a *necessary* item of cost of construction. Otherwise, the investors have to face at the outset a confiscation of 20 per cent. of the necessary original investment.

In this connection it is to be noted that Mr. Frank, while supporting the Interstate Commerce Commission against Mr. Gaines' criticisms, indorses the investment of "depreciation" reserves in plant and then states that these investments "are unalienable." If the plant paid for from reserves represents an unalienable investment, certainly the original investment should be at least equally secure from confiscation.

In your editorial you say:

"The commission's theories about depreciation and charges for retirement are in general sound. Any number of individual instances may be cited where the facts would fail entirely to conform to the theory; but this does not vitiate the general soundness of the rules for charging depreciation. . . . Co-operation between individual railroad companies and the Interstate Commerce Commission should, if the commission takes a broad point of view and the railroad managements a helpful attitude, minimize the hardship that will be worked on present security holders."

There is some evidence that the Interstate Commerce Commission is now more inclined than formerly to take a broad view of its grave responsibility; there is also some evidence to the contrary. Let us hope for the best. One instance of greater breadth of view on their part is found in the public statement made by Judge Prouty and Commissioner Daniels that engineers should be included in the personnel of our commission boards instead of being employed only as members of the staff. This is a decided, though tardy, concession. In this connection I am reminded of an opinion expressed by a man eminent in the engineering profession, H. L. Gantt, in his paper—The Relation Between Production and Cost—presented at this year's spring meeting of the American Society of Mechanical Engineers:

> "The cost accountant of the future must himself be an engineer."

Here we may well bear in mind that a man may be competent as a keeper of books, and yet not be qualified in the principles of accountancy and the fundamentals of the business under consideration.

If each of our commissions had as a full member as least one competent engineer, trained in theory and practice, a man of character and judicial temperament, and qualified as an administrator by extended practical experience, there would be more hope for definite improvement in the line of justice and common sense in regulation by commissions.

I speak from my own experience when I say that the executives of railroads and other public utilities are far more likely to do their full part in the line of co-operation advised in your editorial than are the members of our commissions.

The tremendous authority placed in the hands of our commissions, including the three functions of government which, according to our traditions, should be kept separate and apart, is a fundamental fault and puts before the commissions a temptation too strong for the average man to resist.

In conclusion I must dissent positively from your statement:

> "The commission's theories about depreciation and charges for retirements are in general sound."

So long as the commission confounds actual depreciation with the accruing liability for renewals and replacements and in any degree deducts from plant valuation on account of this liability, so long will their theories be unsound.

Alex. C. Humphreys,
President Stevens Institute of Technology.

Italian Railway Employees Refuse Bonus.—Press despatches report that the employees of the Italian State Railways at Milan, recently refused to accept 3,000,000 lire ($600,000) offered them by the government for extra work done by them in connection with the mobilization of the army. The railway men at Rome have followed their example and have issued a statement saying, "We would feel ourselves humiliated if we were not willing to give our toil while others give their lives to their country."

Reductions Ordered in Rates on Anthracite Coal

Revenues of Carriers May Be Decreased $8,000,000 by Lower Rates Ordered to Tidewater and Eastern Points

The Interstate Commerce Commission in a decision given out Friday, August 13, finds unreasonable the rates on anthracite coal in carloads, from the Wyoming, Lehigh and Schuylkill regions of Pennsylvania to tidewater and certain interior eastern points. The commission also condemns certain of the practices of the anthracite carriers, with reference to their subsidiary coal companies. The opinion was written by Commissioner McChord. The case bears the name: "In the matter of rates, practices, rules and regulations governing the transportation of anthracite coal," and is to be found in 35 I. C. C. 220. The decision covers 90 pages and connected with it there is an appendix of 154 pages. An abstract follows, the language of the commission being preserved insofar as possible.

Pursuant to an order of June 10, 1912, a general investigation was made of the rates, and practices governing the transportation of anthracite coal from the Wyoming, Lehigh and Schuylkill regions of Pennsylvania to tidewater and interior points on the lines of the intitial anthracite carriers. The order named all the carriers in official classification territory, but it was found impracticable to extend the inquiry beyond the affairs of the 11 initial carriers, as follows: Central of New Jersey; Philadelphia & Reading; Delaware, Lackawanna & Western; Lehigh Valley; Erie; Wilkes-Barre & Eastern; New York, Susquehanna & Western; New York, Ontario & Western; Pennsylvania; Northern Central, and Delaware & Hudson.

Freight rates on many commodities are but an infinitesimal part of the price which the consumer pays for such commodities. On coal the freight rate is a more important factor. Anthracite coal is very largely a fuel for domestic use, and it is a necessity. That reasonable freight rates should be charged for the distribution of the great fuel tonnage herein involved is of vital importance to the producers and of equal concern to the consumers.

Anthracite coal is mined in three regions in Pennsylvania—the Wyoming, the Lehigh and the Schuylkill. Practically the entire source of supply is confined to an area of 496 square miles, having an extreme distance from northeast to southwest of about 100 miles. The tonnage (in tons of 2,240 lb.) of anthracite coal shipped from the three regions was 3,358,899 in the year 1850, 16,182,191 in 1870, 36,615,459 in 1890, 45,107,484 in 1900, and 71,295,716 tons in 1913. The tonnage shipped has practically doubled since the year 1890. This large tonnage is produced from approximately 302 operations, collieries and washeries.

Anthracite coal is sold in the market in eight sizes. The sizes smaller than pea are a by-product in the preparation of domestic sizes. The sizes larger than pea are designated "prepared sizes" in the carriers' freight tariffs.

The stove and chestnut sizes are in the greatest demand and constitute 40 per cent of the total shipments. The sizes larger than pea size constitute approximately 61 per cent of the total tonnage shipped. Anthracite coal is principally a domestic fuel. Its selling price at tidewater (the wholesale price obtained by the operators) shows a very definite upward trend during recent years, 34 to 49 per cent during the past 13 years.

These carriers are to a large extent interested in the mining and sale of anthracite coal through their affiliations with or their control of separately incorporated coal companies. Two of the carriers, the Delaware, Lackawanna & Western and the Delaware & Hudson, own coal lands and conduct mining operations.

THE LARGE COAL COMPANIES

The Lehigh Coal & Navigation Co. owns a large portion of the railway lines operated by the Central of New Jersey. Under leases entered into from 1871 to 1883 for 900 years, the Central of New Jersey operates the railroads, and the navigation company is obligated to ship 75 per cent of its output over the leased railway lines. The navigation company is not controlled by the Central of New Jersey.

The Delaware, Lackawanna & Western Coal Co. was organized in 1909. It ships and markets all of the coal mined by the Delaware, Lackawanna & Western At the time the coal company was organized the Lackawanna Railroad paid an extra dividend of $13,000,000 to its stockholders, and the latter were allowed to purchase the $6,500,000 stock of the coal company. Most of them availed themselves of that privilege.

The Lehigh Valley Coal Sales Company was organized in 1912. It ships and markets all of the coal mined and purchased by the Lehigh Valley Coal Company. The coal sales company issued $6,060,800 in stock, giving the shareholders of the Lehigh Valley the privilege of purchasing the stock. At the same time the Lehigh Valley paid an extra dividend of $6,060,800 to its shareholders to provide them with the funds to purchase the stock of the coal sales company.

The Reading Company, a holding company, owns the entire capital stock of the Philadelphia & Reading Railway Company and the Philadelphia & Reading Coal & Iron Co.

With these exceptions the stocks of the coal companies that ship the largest portion of the total tonnage of anthracite coal shipped over the railway lines of the several initial carriers are owned by the carriers.

The tonnage shipped by the coal companies amounts to a very large proportion of the total tonnage shipped by all shippers over each particular railway system.

RATES ON ANTHRACITE COAL

Generally speaking, all the collieries on the lines of any one of the initial carriers in each region are, under the schedules of rates established by the carriers, covered by blanket rates to a particular destination; that is, the several collieries in each region are placed in one group taking the same rate, although the distance between the collieries in the group may be 50 miles more or less. To many important groups of destinations also the rates via any given line are frequently the same; that is, they are blanketed from all the regions reached by that line. Exceptions to this rule apply principally to local short-haul rates.

Rates to Tidewater. For many years a large number of the independent operators sold their coal at the mines to the carriers, or to their allied coal companies, in accordance with the terms of "percentage contracts." Instead of a fixed money price per ton, the independent operator received a certain per cent of the average price at which that grade of coal was sold in New York harbor.

The percentage of the tidewater selling price paid to the operators on prepared sizes of coal was, in the early years, about 40 per cent. It gradually increased, reaching 50 and 55 per cent in the eighties, 60 per cent in 1892, and 65 per cent on November 1, 1900. The remaining portion of the selling price of the coal, 40 or 35 per cent in the more recent years, was the freight rate which the carriers charged the individual operators who elected to ship their own coal production to tidewater. The percentage freight rate was also applied on anthracite coal shipped to Buffalo in the early days. In 1882 the Reading rate on anthracite coal to Buffalo was 57 per cent of the selling price at Buffalo.

In July, 1901, several of the carriers took action to establish fixed or flat rates to tidewater. Six of them, the Reading, Lehigh Valley, Jersey Central, Lackawanna, Erie and Susquehanna & Western were represented on the board of directors of the Temple Iron Company, which was merely a holding company

for the several carriers. Through this medium rates were established for outside shippers as follows: Prepared sizes, $1.60; pea, $1.45, etc.

The rates to the lower ports, such as Perth Amboy, are 5 cents per ton less than those to the upper ports because of the higher cost of lighterage from the lower ports. Thus the rates to New York City are equalized.

The rates actually charged by the Lehigh Valley on anthracite coal from the mines to tidewater, for November in the years named, were:

Year.	Prepared sizes.	Pea.	Buckwheat.
1898	$1.3930	$1.1225	$1.1312
1899	1.4965	1.1887	1.1695
1900	1.55	1.3204	1.2290
1901-1910, inclusive	1.55	1.40	$1.25-1.20

The prevailing percentage rates at the time the flat basis of rates was adopted became the tariff rates to tidewater. The definite upward trend of the rates based on a percentage of the selling price is clearly set forth in the Lehigh Valley figures. Rates based on a percentage of the selling price of a commodity whose selling price increased from year to year would naturally cimb to an excessive basis.

The Percentage Contracts Established Excessive Rates. It appears that the 35 per cent division of the selling price of the coal constituted an excessive freight rate, and it was fixed at a high basis in order to make it more advantageous to the individual operator to sell his output to the railroad interests at the mines than to ship it to market.

UNNECESSARY RAILWAY CONSTRUCTION AND PROJECTED RAILWAY LINES

The history of the development of anthracite mining presents a series of persistent but apparently unsuccessful struggles by the individual operators against the conditions imposed by the carriers. The independent shippers did all in their power to promote the construction of additional railway lines. Some of such efforts were unsuccessful, but at the present time eight railway lines extend into the Wyoming region. It is apparent that the Wyoming region was already adequately served by railway lines before the extension of the last two lines, the Ontario & Western and the Susquehanna & Western, into that region subsequent to 1890. Under normal conditions, wherein the interests of the carriers and the shippers were not antagonistic, with the construction of additional tracks when needed the region would have been amply served by the six railway lines which were constructed into that region prior to 1890. Under existing conditions the anthracite tonnage is charged with the burden of earning an income on the investments in a large portion of two railway lines which were not required and which surely would not have been constructed had proper conditions existed in the marketing of the commodity.

The resistance of the individual operators to the rates and selling conditions imposed by the carriers is well illustrated by the efforts of the individual operators to cause the construction of additional lines of railway into the Wyoming region. The construction of two of these projected lines, the New York, Wyoming & Western and the Delaware Valley & Kingston, was prevented by the action taken by several of the respondent carriers.

CONDUCT OF THE CARRIERS AND THEIR ALLIED COAL COMPANIES

The act to regulate commerce imposes on these carriers the obligation to establish and maintain just and reasonable rates, and it prohibits the granting of rebates or concessions from or offsets against the established rates whereby interstate shipments shall by any device be transported at less than the lawfully established rates, or whereby any advantage is given or discrimination is practiced amongst shippers. Although published rates may be collected on the shipments transported, concessions and offsets may be extended by the carriers or the interests who control the carriers to favored shippers. These concessions and offsets are as prenicious as direct rebates, and it matters little whether they are in the form of cash payments, interest charges, royalty earnings, the use of valuable property at inadequate rent, the free use of the carriers' funds or credit or other insidious means, if they confer concessions and advantages which place certain shippers in a position of preference and advantage over competitors who are also customers of these carriers. Some of the advantages granted to the coal companies that are allied with the carriers are disclosed by the following facts established in this case:

Reading Companies. The evidence shows that prior to the reorganization of the Reading companies in November, 1896, the Philadelphia & Reading Railroad had advanced to the Philadelphia & Reading Coal & Iron Co. $76,154,000. In December, 1896, the Reading Company, the present holding company, became the owner of this debt and the creditor of the coal and iron company. From December, 1896, to October, 1913, the holding company extended to the coal and iron company financial assistance, which increased the indebtedness so that in October, 1913, it was $82,980,000. The coal and iron company has paid no dividends to the holding company on its stock, and it has paid very low rates of interest on the indebtedness. The payments of interest actually made by the coal and iron company to the holding company were $34,000,000 less than the amount of such interest, computed at 4 per cent, from December 1, 1896, to June 30, 1913.

On the date the holding company acquired this indebtedness, December 1, 1896, it immediately entered the $76,154,000 in its accounts as an asset and issued its own obligations to the amount of every dollar of assets it possessed, including the said $76,154,000. The income of this holding company during recent years has been from $14,000,000 to $15,900,000 per annum, and with the exception of the inadequate payments of interest made by the coal and iron company and from $200,000 to $300,000 per annum derived from outside sources, this entire income of the holding company has arisen from dividends, interest and rental payments made to it by the Reading Railway lines, and such payments have been at very high rates per annum. This clearly shows the remarkably remunerative character of the rates assessed by the carriers.

The situation here presented is that this shipper, the coal and iron company, ships approximately 10,000,000 tons of anthracite coal annually over the Reading railway lines. Presumably it pays the tariff rates on this product. The carrier and the coal company are but the subsidiary corporate hands of the holding company, inasmuch as the same interests direct and administer the affairs of the three corporations. By the aid of the railway earnings that are paid into its treasury, the holding company furnishes the coal and iron company with its working capital. The holding company also assumes the burden of the interest charges on the capital invested in the properties of the coal and iron company, and the railway earnings enable it to do so. These facts constitute an unlawful discrimination against other shippers who are competitors of the Coal & Iron Company.

Published tariff rates are of no significance to this shipper, the Philadelphia & Reading Coal & Iron Company, under these circumstances. The same executive officials control and administer the affairs of the railway company, the coal and iron company, and the holding company; therefore the coal and iron company receives offsets, against such published rates, in the form of interest charges which are waived by the same parties who are charged with the duty of collecting and retaining the full published tariff rates on all shipments. These facts have been referred to the department of justice.

Central of New Jersey. Similarly reference is made to the dealings of the Central of New Jersey with the Lehigh Coal & Navigation Company. The coal company leases to the railway lines of railroad for which the New Jersey Central has paid compensation of upward of 10 per cent. yearly. At the same time the carrier has transported coal for the coal company at reductions of from 11 to 23 cents a ton below the tariff rates. These reductions are known as lateral allowances and result from the tenth covenant of the lease in which it is provided that

on coal delivered by the Navigation Company on sidings at the northern end of the Nesquehoning tunnel for transportation by the carrier, the rates should not exceed the rates from Penn Haven. Although the carrier for many years has transported the shipments the Navigation Company at the Penn Haven basis of rates, it has published in tariff form a higher basis and then at the close of each month's business paid back to the shipper a portion of these established tariff rates.

Reference is also made to the dealings of this carrier with Burns Brothers, who lease from the railroad docks and trestles in New York harbor, and to the dealings of the other carriers with their related coal companies.

THE COMMODITIES CLAUSE.

The mining, transportation, and to a considerable extent the selling operations necessary to market this commodity, though in a sense being each conducted under the name of separate corporate entities, are united under one management and control. The relations of the controlling carriers and the coal companies have not undergone any substantial changes since the effective date of the commodities clause in the Hepburn Act, May 1, 1908, with the exception that the shipping and marketing of the coal production of the Lackawanna, the Delaware & Hudson, and the Lehigh Valley Coal Company are now performed by the Delaware, Lackawanna & Western Coal Company, the Hudson Coal Company, and the Lehigh Valley Coal Sales Company, respectively. These three coal companies assumed their present functions after the decision of the Supreme Court in March, 1909, in the Commodities cases (213 U. S., 366), and the decision of the Supreme Court in the Lehigh Valley case, decided April 3, 1911 (220 U. S., 257). The evidence shows that the three coal companies were organized and financed without the interposition of outside interests or capital.

Delaware, Lackawanna & Western. This carrier owns coal lands and conducts mining operations. Prior to August 1, 1909, it sold its own coal in the markets. To rearrange its affairs in conformance with the decision of the United States Supreme Court (213 U. S., 366), the carrier caused to be organized the Delaware, Lackawanna & Western Coal Company. It paid to its stockholders an extra dividend of 50 per cent—that is, $13,000,000—on its stock, in cash, and its stockholders were given the option to use part of the dividend so paid to purchase the capital stock, $6,500,000, of the coal company. Most of them availed themselves of this privilege. Under two contracts entered into between the coal company and the carrier under date of August 2, 1909, the coal company assumed the selling operations theretofore conducted by the carrier.

The carrier conveyed to the coal company its established trade, its stock of coal, its selling facilities, and the good will of its established business at much less than their true and actual value. The use of the properties leased, approximately 170 trestles, at the inadequate rental reserved in the lease has each year constituted a substantial concession to the coal company, a discrimination against competing shippers, and an offset against the freight rates paid to the carrier by the coal company.

Under the contracts between the carrier and the coal company the coal company is obligated to purchase from the carrier all of the anthracite coal which it sells and to purchase no coal from other sources without the written consent of the carrier, and to conduct the business of selling the coal in such manner as best conserves the interest of and preserves the good will and markets of the coal mined by the carrier. The only property owned by the coal company, excepting current assets, is property and fixtures valued at $169,070, and its annual sales of coal amount to approximately $35,000,000. On six months' notice the carrier can discontinue its contractual relations with the coal company and take over the stocks of coal the coal company has on hand. Under such conditions the coal company is merely a dependency of the carrier, and the conduct of its business is subject to the arbitrary will of the carrier.

Ownership by Carriers of Capital Stock of Shipping Corporations. The amendment to the act to regulate commerce commonly known as the commodities clause, has not resulted in a bona fide separation of the affairs of these carriers from the mining and selling of anthracite coal. The dual and inconsistent position of public carrier and private shipper that would exist where the carrier was miner, transporter and seller of this commodity now exists, and is effectuated by the relations of the carriers respondent in this case and the several coal companies allied with and controlled by the carriers. Corporate charters and contracts, as used by these carriers, are merely devices whereby the business of mining, transporting and selling the anthracite coal production of each carrier and its allied coal company are united under one management and directed and controlled by one paramount power.

PRESENT EFFECTIVE RATES ON ANTHRACITE COAL.

The average revenue per ton (2,000 pounds) per mile for all anthracite coal transported by the initial anthracite carriers during the year ended June 30, 1913, is as follows: Jersey Central, 8.37 mills; Reading, 8.82; Lackawanna, 7.40; Delaware & Hudson, 7.54; Lehigh Valley, 7.11; Pennsylvania, 5.99; Northern Central, 6.02; Erie, 5.96, and Ontario & Western, 6.47.

Anthracite coal is hauled in trains that transport the maximum train tonnage. The large tonnage hauled in the trains produces high earnings per train-mile. At the present effective rates the revenue per train-mile on anthracite coal transported to tidewater is, for the Jersey Central, $19.30; for the Lehigh Valley, $16.14, and for the Lackawanna, $16.43. These revenues are substantially higher than average train-mile revenue, the average for the United States in 1912 being but $3.02284; for the eastern district, $3.12891; for the southern district, $2.48888, and for the western district, $3.17357.

Anthracite coal is a low-grade commodity which is transported in vast quantities in trains of maximum tonnage. The car load is much greater than is attained in the loading of most other classes of traffic excepting bituminous coal and ore. Most of the anthracite tonnage is produced from collieries whose daily production, measured in carloads, is very large. These conditions tend toward lower operating costs in transporting this commodity than result from the transportation of most other commodities.

COST OF TRANSPORTING ANTHRACITE COAL.

The commission's examiners computed the cost of service for anthracite coal, including only such costs as are represented in operating expenses. Complete results were reached as to the tidewater movement of anthracite over the Central of New Jersey. The traffic hauled in November, 1912, was the basis of the computations. Part of the operating costs resulting from the transportation of anthracite coal to tidewater on the Lackawanna and terminal costs on the Reading were also compiled.

The conduct of the anthracite traffic involves the collection of the loaded cars from the breakers and washeries into assembling yards, the necessary switching into trains, the road haul to destination, terminal services, and the return of the empty cars. The computations are set forth in detail in the appendix to this opinion, and they indicate how the various services were accounted for in the computations made by the commission's examiners.

Briefly stated, the examiners found that the operating cost of transporting anthracite coal to tidewater by the Central of New Jersey was 59.26 cents per long ton from the Wyoming region (average haul, 160 miles), 44.35 cents per long ton from the Lehigh region (average haul, 120 miles), and 49.04 cents per long ton from the Upper Lehigh region (average haul, 140 miles), making a weighted average of 3.3 mills per short ton-mile to the three tidewater termini of this carrier. The Central of New Jersey costs were computed for a railway line whose average distance to tidewater is shorter than the average haul of the other carriers. We have frequently held that cost of service per ton-mile properly decreases as the length of the haul increases. In the short haul of the Central of New Jersey there are included the assembling costs and the terminal costs which necessarily result in causing a higher cost per ton-mile than would result

under similar operating conditions for the longer haul to tidewater of the other carriers.

The margin of profit on tidewater anthracite is indicated by a comparison of the cost of transportation, 3.3 mills per ton (2,000 pounds) per mile, with the average revenue here shown:

Carrier.	Average haul.	Average revenue per ton. 2,240 pounds.	Average revenue per ton. 2,000 pounds.	Average revenue per ton-mile. 2,240 pounds.	Average revenue per ton-mile. 2,000 pounds.
	Miles			Mills	Mills
C. R. R. Co. of N. J.	140.58	$1.489	$1.329	10.59	9.45
L. V. R. R. Co.	157	1.484	1.325	9.45	8.44
N. Y., O. & W. Ry. Co.	209	1.447	1.292	6.92	6.18
Erie R. R. Co. (including N. Y., S. & W. R. R. Co. and W.-B. & E. R. R. Co.)	169.90	1.407	1.256	8.28	7.39
P. & R. Ry. Co.	185.70	1.338	1.195	7.21	6.44
D., L. & W. R. R. Co.	147	1.300	1.161	8.84	7.90
P. R. R. Co. (including N. C. Ry. Co.).	221.43	1.347	1.203	6.08	5.43

CARRIERS' INVESTMENT AND INCOME AS DEDUCED FROM THEIR BOOKS.

The carriers submitted statements concerning their investment in road and equipment and in working capital, their net operating income, and the ratios of net operating income to investment for a number of years.

The investment, total property devoted to public use, as thus presented by the carriers, and the per cent. of return on the investment produced by the net operating income as adjusted are here shown:

Carrier Year ended June 30, 1913.	Book value of property devoted to public use.	Net operating income.	Rate of income on investment.	Amount of income. In excess of 6 per cent. per annum.	Amount of income. Less than 6 per cent. per annum.
			Per Ct.		
D., L. & W. R. R.	$187,102,870	$14,450,741	7.73	$3,224,569	.....
Reading	238,325,264	21,836,887	9.16	7,537,371	.....
D. & H. Co.	107,906,939	8,990,587	8.33	2,516,171	.....
C. R. R. of N. J.	94,827,868	8,269,160	8.72	2,579,488	.....
N. Y., O. & W. Ry.	56,694,648	2,471,471	4.36	.....	$930,208
L. V. R. R.	196,753,503	12,985,175	6.60	1,179,965	.....
Pennsylvania and Nor. Central	753,420,790	42,431,006	5.63	.....	2,774,241
Erie	386,648,946	16,246,206	4.20	.....	6,952,731
N. Y., S. & W. R. R.	44,155,784	1,010,923	2.29	.....	1,638,424

The combined investment of the several carriers, including working capital, was shown to be $2,131,046,429 on June 30, 1914. By merging the book entries of property costs of their various railway lines the carriers have proceeded to the conclusion that 6 per cent. per annum is the lowest possible suggestion as to what would constitute a fair return on the investment, and that "a legislative command to accept anything less than 6 per cent. would be adjudged to be confiscation."

In considering this question we do not suggest that 6 per cent. per annum income is too high a rate of return on railroad investments or too low a return. The stockholders of several railways operated by the initial anthracite carriers have leased their properties to anthracite carriers for a return of 4 per cent. per annum on their investment; some properties are leased at 7 per cent. per annum, and some at 10 per cent. per annum under long term leases

The trouble is that the investment shown in the carriers' statements does not represent cost of property nor an approximate figure of cost.

The evidence shows that the road account, now designated "cost of road," was used prior to 1907 as a general clearing account into which were charged valueless and uncollectible items and liabilities which could not conveniently be absorbed into other accounts. This was not considered wrongful or bad bookkeeping in those days, and we do not desire to criticise these carriers now for such past practices.

Property costs deduced from the old books of these carriers are not reliable. The fault is back of the books. This is well illustrated by the cost of construction of the Port Reading Railroad, which the carriers' expert has ascertained from its books to have been $3,025,000. This railroad is of recent construction, being completed in 1894. The commission's examiners found, by their review of the construction contracts and records, that the actual cost of constructing this railroad was $1,525,000, and that the book cost includes $1,500,000 representing a bonus payment in securities to the construction company. Such practices were so prevalent in railroad construction in former years that we must regard property costs deduced from the old books as very unreliable.

The property costs per mile of line shown for the Erie are $199,832, and for the New York, Susquehanna & Western, $200,213, while for the Reading they are $157,732, and for the Pennsylvania, $180,543. Such property costs for the New York, Susquehanna & Western, whose terminal properties are very limited in comparison with the other lines mentioned, clearly indicate the unreliability of book costs as representative of actual cost of property.

The carriers have used the term "total property devoted to public use" as representative of the investment in their railway properties devoted to public use. They have included in their investment the cost of properties rented to tenants and used for private purposes, and they justify this by the assertion that it was acquired for railroad purposes and may in the future be used for railroad purposes.

Unproductive Betterments. The Pennsylvania has expended on its new passenger terminal properties in New York City approximately $114,000,000. These properties are operated by the Pennsylvania Tunnel & Terminal Railroad Company, and the operations result in deficits each year. The deficit in the year ended June 30, 1913, was $2,087,000. The record shows that the terminal was constructed for the benefit of the Pennsylvania lines west of Pittsburgh as well as the lines east of Pittsburgh, but no part of its cost is, by the carrier, assigned to the income of the lines west of Pittsburgh. In the statements of investment and income the deficit is charged to the income of the Pennsylvania Railroad (the lines east of Pittsburgh), and the per cent. of net operating income on the investment for the Pennsylvania Railroad is substantially reduced because of these deficits and the large investment in this terminal property. The record shows that when the New York Connecting, now under construction, is completed the terminal properties will some time in the future be used for passenger traffic between the Pennsylvania lines and the New Haven. Thus the question is presented: Must the present effective freight rates of the Pennsylvania earn an annual return of 6 per cent. on the investment in these passenger terminal properties? The record shows that $47,000,000 of the expenditures in this property has been charged to profit and loss and to income of the Pennsylvania; that is, its past surplus income has already contributed $47,000,000 to the cost of this property.

The commission notes at this point that the total property investment given above includes the cost of lines which, as noted previously, would not have been built had proper treatment been given the independents.

INCOME OF THE INITIAL ANTHRACITE CARRIERS.

For the year ended June 30, 1913, the total operating revenues of these carriers were $448,711,496, their total freight revenues were $342,499,310, and the revenue they derived from transporting anthracite coal was $96,516,183. The ratio of their anthracite coal revenues to their total freight revenue ranged from 6 per cent. to 86 per cent.

The operating revenues earned by these carriers have increased greatly during the past 10 years, as shown by the averages per mile of line following:

	1904	1913
C. R. R. of N. J.	$29,769	$42,016
P. & R. Ry. Co.	33,795	49,553
D., L. & W. R. R. Co.	35,222	42,275
L. V. R. R. Co.	21,456	29,665
D. & H. Co.	17,682	28,115
P. R. R. Co.	30,097	45,101
N. C. Ry. Co.	21,962	27,147
Erie R. R. Co.	21,926	27,147
N. Y., S. & W. R. R. Co.	13,655	18,954
W.-B. & E. R. R. Co.	6,751	7,180
N. Y., O. & W. Ry. Co.	12,165	16,715

Of all the railways in the United States with annual operating revenues of $1,000,000 or more, only three besides those above indicated had revenues in 1913 and in 1914 averaging $40,000 per mile of line or more. The three exceptions are the Pittsburgh & Lake Erie, the Bessemer & Lake Erie, and the Bingham & Gar-

field. The very unusual traffic conditions enjoyed by the first two roads are well known, while the third is a heavy carrier of ore, so that the four initial anthracite carriers showing such unusual earning capacity hold a position unquestionably unique among the steam transportation systems of the country having diversified traffic.

The exceptional earning capacity of the principal anthracite carriers is well illustrated when comparison is made with the average operating revenue per mile of line of the following representative carriers for 1913:

New York Central & Hudson River, $30,776; Baltimore & Ohio, $22,789; Buffalo, Rochester & Pittsburgh, $19,113; Michigan Central, $19,448; Pittsburgh, Cincinnati, Chicago & St. Louis, $30,236; Hocking Valley, $22,241; Illinois Central, $13,497; Louisville & Nashville, $12,338; Atlantic Coast Line, $7,833; Virginian, $11,896; Chesapeake & Ohio, $15,129, and Norfolk & Western, $21,623.

The net corporate income of these carriers has enabled them not only to pay the very substantial dividends shown by these figures, but also to set aside large amounts for the purchase of additional property and still have considerable amounts remaining to add to their surplus. In addition to providing for necessary expenses and charges and for generous dividends, the Central of New Jersey, the Reading, and the Lackawanna have set aside from income $74,607,157 for additions and betterments to their properties. During this period the capital obligations of these carriers have actually decreased, indicating that their net income has not only provided for the necessary maintenance of their properties and for substantial dividends, but has also provided the improvements to the properties necessary to handle the large increase in traffic. The Lackawanna recently has issued capital stock to its shareholders at par to provide funds for large improvements to its property, but the improvements were not available for use during the 10-year period.

The Less Prosperous Roads. For the reasons underlying the Erie's failure to earn satisfactory net income it is necessary to look further than the net operating results. One reason is found in its high capitalization. The Erie's operating revenue per mile of road is considerably lower than that of the principal anthracite carriers.

To its over-capitalization and the resulting burden as well as traffic conditions can be ascribed the failure of the New York, Susquehanna & Western to earn satisfactory net income.

The small volume of its local traffic and the limitations as to the tonnage of the anthracite coal traffic which the New York, Ontario & Western can command preclude the possibility of its income ever mounting to the high standard of earnings which result to its more fortunately situated competitors that reach New York harbor.

POSITION OF THE CARRIERS.

Counsel for the carriers has frankly admitted that the cost of transporting anthracite coal is so low that the revenues resulting from the anthracite coal rates are sufficient not only to pay the costs chargeable to the anthracite traffic, but to take care of the general costs, which other traffic cannot take care of because of lower rates assessed for the transportation of other traffic; but counsel stated that the actual cost of transporting anthracite, when it could be ascertained, would be higher than the cost computed by the commission's examiners.

The carriers have stated upon their briefs that "in the end this study of cost accounting reaches the inevitable condition of the railroad business of the United States, that railroad rates must be made with regard to what the traffic can afford to bear."

The experience of shippers and carriers in the past resulted in the enactment of the act to regulate commerce, and the law limits such principles of rate making, at least to the extent that the rates on the low-grade commodities must be just and reasonable to all shippers and not discriminatory. The transportation of this low-grade commodity, anthracite coal, has been termed by these carriers "their backbone traffic." They are engaged in producing and selling, as well as transporting it. We cannot overlook the fact that some force has brought the production and sale of most of the tonnage of this commodity under their control. If they established excessive rates on anthracite they became the beneficiaries of conditions which were prejudicial to the business of the individual operator or shipper. The power to fix freight rates on this commodity was the opportunity to confiscate property if the carrier so willed.

Our railroad properties should be kept in a high state of efficiency, and freight rates should be sufficiently remunerative to permit it. Necessary improvements should be made to the properties. The carriers respondents in this case command a traffic of exceptional volume and density, and all these results can be accomplished by them without imposing excessive and unreasonable rates. The more important reductions ordered by the commission are as follows:

Delaware, Lackawanna & Western to Hoboken, Paterson, Newark, Boonton and Washington, N. J., prepared sizes, from $1.60 per ton to $1.45, $1.35, $1.40, $1.20 and 95 cents to those points, respectively; other sizes from $1.45 to $1.35, $1.22, $1.30, $1.09 and 86 cents. To Binghamton, Waverly and Elmira, N. Y., prepared, cut $1.50 to 90 cents, $1.15 and $1.25; other sizes, from $1.50 to 82 cents, $1.05 and $1.14, respectively. To Corning and Syracuse, N. Y., prepared, from $1.90 to $1.35 and $1.40; smaller sizes, cut from $1.65 to $1.17 and $1.22. East Lancaster and Utica, prepared, $2 to $1.90 and $1.50; other sizes, $1.75 to $1.66 and $1.31.

Lehigh Valley to Jersey City and Newark, prepared, from $1.60 to $1.45 A. D., $1.40; smaller sizes, $1.45 and $1.40 to $1.35 A. D., $1.30. To Ithaca, prepared, $1.65 to $1.45; smaller, $1.50 to $1.32. To Phillipsburg, N. J., from Wyoming region, prepared, from $1.45 to 95 cents. From Lehigh and Schuylkill regions, prepared, from $1.30 to 85 cents, prepared, from $1.30 to 85 cents; smaller sizes, Wyoming, prepared, from $1.15 to 75 cents; Lehigh and Schuylkill, prepared, from $1 to 68 cents. To Rochester, N. Y., prepared, $1.90 to $1.85; smaller, $1.05 to $1.61.

Erie to Jersey City, Paterson, Newark, N. J., Middletown and Port Jervis, N. Y., prepared, from $1.50 to $1.45, $1.35, $1.40, $1.05 and 90 cents, smaller sizes from $1.45 to $1.35, $1.22, $1.30, and 95 and 82 cents. To Binghamton, N. Y., prepared, from $1.65 to 90 cents; smaller, $1.50 to 82 cents. To Elmira, prepared, $1.65 to $1.25; smaller, $1.50 to $1.14. To Rochester, prepared, from $2 to $1.85; smaller, $1.75 to $1.51.

Central of New Jersey to Jersey City and Newark, prepared, $1.60 to $1.45 and $1.40; smaller, from $1.45 to $1.40 to $1.35 and $1.30. To Elizabeth and Somerville, N. J., prepared, $1.55 each to $1.40 and $1.20; smaller, from $1.40 to $1.30 and $1.09. Phillipsburg from Wyoming region, prepared, from $1.45 to 95 cents; from Lehigh region, prepared, from $1.30 to 85 cents; smaller, from $1.15 and $1.00, respectively, to 75 and 68 cents.

Delaware & Hudson to Windsor, N. Y., prepared, $1.65 to 85 cents; smaller, $1.40 to 72 cents. To Albany, Troy and Mechanicsville, N. Y., prepared, from $1.93 to $1.60; smaller, from $1.60 to $1.31.

From the Central of New Jersey producing points to the Elizabethport and Port Johnston, N. J., piers, from $1.55 a ton on prepared coal to $1.40, and from $1.40 to $1.30 on pea and smaller sizes. To Communipaw pier and Port Liberty, N. J., prepared, from $1.60 to $1.45, and on smaller sizes by 10 cents a ton. Similar reductions ordered on the various lines to Weehawken, Perth Amboy, Undercliff and South Amboy, N. J.

Several of the respondents have granted the exclusive use of some of their piers, docks, storage plants, retail delivery trestles, and other properties to their allied coal companies at inadequate rental charges and under conditions which constitute substantial discrimination in favor of such coal shippers. The exclusive right to operate certain of the carriers' public docks and piers has also been granted to such coal companies, who in operating such properties gain information as to the shipments of their competitors, handled over the docks and piers, which section 15 of the Act to regulate commerce prohibits common carriers from giving to shippers and prohibits shippers from receiving from common carriers. We assume the carriers will at once adjust these practices to remove the discrimination and conform with the requirements of the law.

The evidence shows that several of these carriers have in the past declined to establish joint rates for all shippers, while the coal production of their allied coal companies has been accorded an interline movement by means of trackage arrangements and the free transportation to junction points of the coal production exchanged by the coal companies controlled by the carriers. Such a practice is unlawful and is discriminatory in its worst sense, since the discrimination results to the benefit of the carriers. The carriers will be required to establish through routes and to publish joint rates, of which other shippers may avail, such as will neutralize any such undue benefit heretofore enjoyed by the coal operations of railroad ownership.

Commissioner Harlan, Dissenting. In my judgment the record before us here justifies a modification of many of the present

rates, but for the future a rate structure on anthracite coal based upon the general standard of the Meeker case, surcharged, so far as that would result in a reasonable rate schedule, with the 5 per cent. increase that has been imposed in The Five Per Cent. case upon substantially all other traffic in official classification territory, would seem to be a more consistent disposition of the case.

THE TRAIN DESPATCHER

By One of Them

In many respects the despatcher is like a ship without a rudder on a tempestuous sea. He must fight his way through the multitude of obstacles that obstruct the way, all by himself; even though he use his best judgment at the time, his anticipations may not materialize for the best and then he is open to criticism by everybody from the call boy to the general manager's office. Many times the criticisms are unjust, no thorough investigation being made of the surrounding conditions at the particular time.

The feeling seems often to prevail among his superiors that if a bad move is made he is "laying down on the job." It has always been a profound mystery to the writer, why these critics do not see that the despatcher is just as much interested in good service, just as anxious to make good meeting points, to avoid delays to trains, to reduce overtime and to rightly handle any irregularity that comes up as any one in the employ of the company. He worries over bad moves a great deal more than do his superiors. How often do you see him in his chair after his hours are up and the relief man standing by ready to take the transfer. He has in hand some complicated condition that he is anxious to straighten out; not because he can do it better than his relief, but because he has the outline in his mind and possibly can do it in less time than he could explain it; and also because of the natural satisfaction in finishing a job that has been begun. How many times have you seen him come back to the office after going home to see how some complicated affair worked out, or to see that the other man completely understands some proposition to be handled.

He has certain rules laid down to work by, but it is a foregone conclusion that some of these rules at times will have to be violated in order to make some emergency move which is for the interest of the company. As an example, the management says, "Passenger trains must run on time; freight trains must be kept out of their way; despatchers must keep freights off the time of passenger trains twenty minutes; certain red ball trains must have the same treatment as is accorded passenger trains so far as the despatchers are concerned; certain forms of orders must be used in all cases, and some forms he is ordered not to use at all. The despatcher finds a train close to the sixteen-hour limit, or on overtime, which, if allowed five or ten minutes on a passenger or fast freight, can be got in, thereby saving overtime and avoiding tying up the engine on the road. The passenger or fast freight undoubtedly will recover the time used to advance the belated train. If the despatcher adheres strictly to his instructions he may be censured for not taking a chance; if he takes a chance and everything goes all right, there may be nothing said (in this particular case); but if a drawbar is pulled out or something happens to make a bad job of it, then the old instructions are flashed in his face, and he is called a poor despatcher. Many things just like this confront the despatcher every day.

I have in mind a case where an important stock train creeped up on the sixteen-hour limit; ten minutes on a fast passenger train would move the freight to the terminal; the despatcher took the change, and he was discharged for disobeying his instructions. But did he not save the company money by this move? A like infringement of the rules by some trainman or engineman, and with such sentence imposed, would have been followed quickly by a visit from the committee and the offender, after a few days, would be reinstated, and maybe with full pay for the time out of service.

Many times prejudice arises against a certain despatcher in the office, and some local officer goes back and checks him on every little move that he has made, and then makes a show to the superior officer that the despatcher is not doing his work satisfactorily. But no investigations were made to bring out the existing conditions at the time the so-called bad work was performed, and now it is taken for granted that the despatcher was at fault.

What does it cost to make a despatcher? What does it cost to break in a despatcher, even though he be what they call an experienced man, from another line? What does it cost to break in one that has had no experience at all? It is estimated that it costs a railroad company $5,000 to make an engineer. If that much for an engineer who handles one train, what would be a fair estimate for a despatcher who handles all of them on from one to three divisions?

The despatcher is the commander-in-chief of the division in the absence of the superintendent, trainmasters and chief despatcher, and he must be qualified to act in their stead judiciously, expeditiously and economically. In the face of this, how about his surroundings in the office? Has he a quiet office where he can figure and study out these questions? Generally the latch string is on the outside of the door and nearly every one that desires comes in; they think nothing of asking the despatcher about this, that and the other thing, even without taking time to see if he is busy; they poke their heads in at the door and shout at him. Frequently there is a telephone or two in the office connecting to the yard, roundhouse, ticket office, freight house, car office, water service shanty, etc., and there is a continual ringing of bells. This interrupts him even though some one else is doing the calling and talking. If he is located near the yards where switch engines are working the whistling and other noises will disturb him in his work.

If the telephone despatching circuit is used for other purposes conversations thereon distract his attention from his work. No man can sit with a telephone on his head—and the despatcher is required to keep it there all the time—and be forced to hear miscellaneous conversations, and still be able to concentrate his mind on the trains.

Telephone lines have brought in some new annoyances. Batteries at outlying stations are sometimes allowed to run down, so that you cannot hear the operators plainly. Where does "safety first" come in when the despatcher makes out reports, traces cars, and has to do other jobs just because he seems to have an idle moment now and then? His hands may be idle but, no doubt, his brain is working.

Is it reasonable to suppose that a man can give the necessary attention to the handling of trains while he is forced to have his train sheets covered with reports, with some one running over to his desk every now and then to pull at his sheets and maybe take them off the desk entirely for a while?

The despatchers of to-day have more to do than they did twenty years ago, for the reason they have the sixteen-hour lay, the live stock confinement law, and other laws to contend with. The telephone has given the despatchers of to-day about double the territory they used to have. It may be said that with the telephone the work can be done easier and quicker. Granted, but the load on the mind has not decreased one bit.

The Southern Shan States Railway of India.—The Shan States are on the inland side of Upper Burma. The southern Shan States touch Chinese territory, Tonking and Siam and the Southern Shan States Railway runs mainly in an east and west direction, branching off from the Burma Railway's main line from Rangoon to Mandalay, at Thazi, 306 miles from Rangoon. It is a metre-gage road and as planned is to be 103 miles in length. At present it has been completed and put in operation as far as Aungban, at mile 72, and the continuation to Heho is being undertaken, but further work beyond that point will have to be postponed for the present. The cost of the present line differed but 2.8 per cent from the estimate. The line has been constructed at the cost of the government by the Burma Railways Company and will be operated by the latter.

Lateral Stresses on Rails in Curved Tracks

Experiments with Ten-Wheel, Pacific, Consolidation and Mikado Locomotives: Also Tenders and Cars

By George L. Fowler.
Consulting Mechanical Engineer.

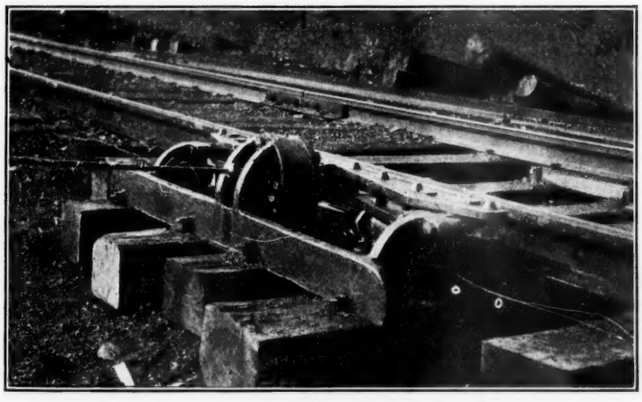
Supplementing the investigations of the lateral stresses on rails in a straight track, which were described in the *Railway Age Gazette,* June 11, 1915, page 1231, an investigation was entered upon to make a similar determination on sharp curves, with this difference, however, that whereas the thrust on the rail in the straight track was taken as that of the heaviest of the engine as a whole, the apparatus used on curves measured the thrust on the outer rail of each individual wheel as it passed. This apparatus

Track and Recording Apparatus for Measuring Lateral Thrust of Wheels on Rail

is the same as that originally designed to measure the outward thrust of car wheels on the outer rails of curves, as described in the *Railroad Gazette,* November 15, 1907, and furnishes a graphical record of the thrust of each individual wheel.

The apparatus was first installed in the outside rail of a 6 deg. 12 min. curve which had a total length of 215 ft.; the apparatus was placed 130 ft. from the east end. The outer rail was elevated 5 in., the gage was widened ¼ in., and the location was on a 1.31 per cent. grade, dropping to the west. A curve of 6 deg. 12 min. has a radius of 462 ft., and the elevation of 5 in. compensates for a speed of 24.4 miles an hour.

The second location was in the outer rail of an 8 deg. 7 min. curve. The radius of this is 353 ft. The 5 in. elevation of the



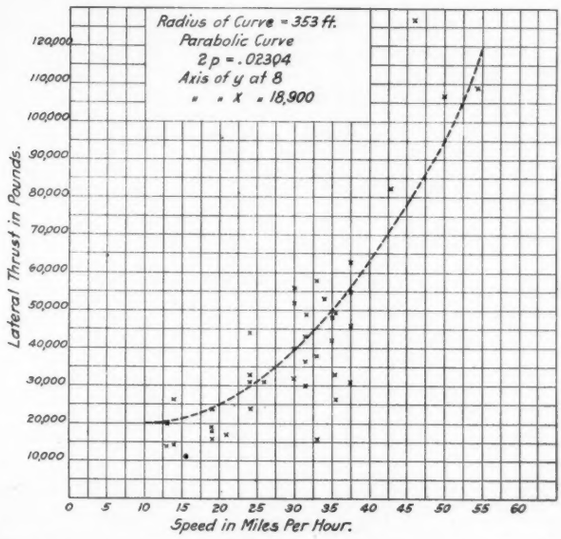
Track Apparatus for Measuring Lateral Thrust of Wheels on Rail

outer rail compensated for a speed of 21.3 miles an hour. The gage was widened ⅜ in. The total length of this curve was 237 ft., and the apparatus was located 122 ft. from the east end. The grade was .8 per cent., dropping to the west.

The apparatus was put in service at about 8 o'clock in the morning and records were taken of all locomotives passing until above 5 in the evening. During the night the movable rail was bolted rigidly in place so that it had no effect on the recording apparatus.

The speed of passing trains was obtained by setting a twig, carrying a piece of paper, in the center of the track, 176 ft. from the apparatus, and another at the apparatus itself. An assistant started a stop watch when the pilot of the locomotive struck the first twig and stopped it when it struck the second. As 176 ft. is the distance traversed in two seconds by a locomotive traveling 60 miles an hour, it was simply necessary to divide 120 by the number of seconds occupied in passing from one twig to another to obtain the speed of the train in miles per hour.

The apparatus was in the 6 deg. 12 min. curve 11 days and in the 8 deg. 7 min. curve 10 days. In these periods records were obtained of 40 different locomotives in the first and 16 in the second curve, running at speeds of from 6.1 to 54.5 miles an hour, the great majority, however, falling between 25 and 40 miles an hour. In all there were 45 different locomotives, of which 4 were



Lateral Thrust on Rails for Consolidation Locomotive Running at Different Speeds Over an 8 deg. 7 min. Curve Elevated for a Speed of 21.3 Miles Per Hour

of the Ten-Wheel type; 6 Pacific; 25 Consolidation, and 10 Mikado.

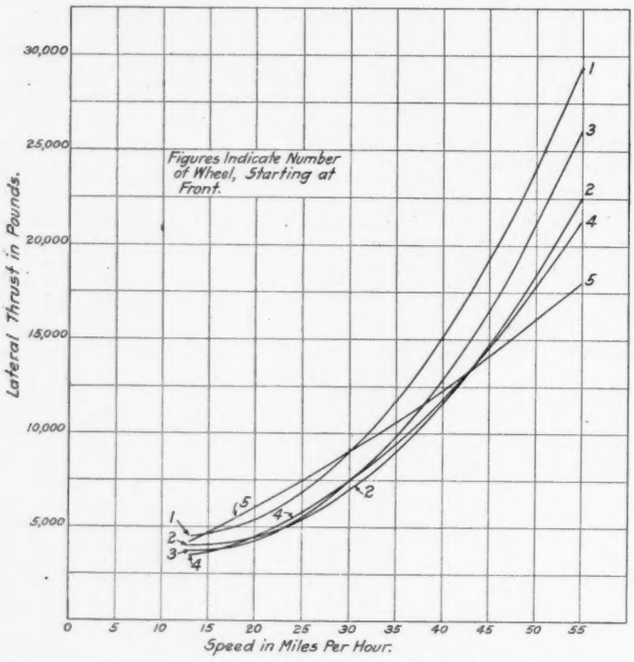
As in the case of the experiments on a tangent track, a complete survey of the lateral play in the axle boxes of each of the locomotives was made. The records have been grouped in a series of tables with each type of locomotive by itself. Of all types tested the largest number of records were obtained with the Consolidation—40 on the 6 deg. 12 min. curve and 41 on the 8 deg. 7 min. curve. They therefore present the best opportunity for drawing conclusions, and will be considered first.

No final conclusions can be drawn as to the effect of the lateral play of the axles in their boxes on the lateral thrust of the wheel on the rail. The records are, seemingly, contradictory and confusing, but a careful examination seems to indicate that an excess of lateral play tends to increase the lateral thrust. Whether this would hold in the case of an engine on which the lateral play was entirely eliminated there is nothing to show.

The stresses with the wedge trucks seem to run higher than with the swing trucks. This does not always appear in the truck,

but may appear in the total thrust of the engine. In the case of the Consolidation locomotives on the 8 deg. 7 min. curve, the total thrust of those having the wedge trucks was almost invariably higher than with those having the swing trucks. The same thing appears in a general way, though to not quite so pronounced an extent, in the thrusts on the 6 deg. 12 min. curve. On the 8 deg. 7 min. curve this holds for the leading truck wheel; but for the 6 deg. 12 min. curve the excess so far as the front truck is concerned largely disappears, though, in the majority of cases, the thrust of the wedge truck is more than that of the swing.

In making comparisons of the lateral thrust exerted by any



Comparison of Individual Wheel Thrusts for a Consolidation Locomotive at Different Speeds on an 8 deg. 7 min. Curve Elevated for a Speed of 21.3 Miles Per Hour

type of engine, it was found necessary to take the sum of the thrusts of the individual wheels in order to gain an idea as to what the engine was doing, because of the slight actual difference of pressure exerted by any one wheel at different speeds. This I have used as a basis. As for the different wheels it will be found that there is a certain sequence of relative pressure that is peculiar to each type, but when the work is considered with reference to the speed it is necessary to take the total thrust of all of the wheels in order to get the range needed to draw conclusions.

After plotting the individual runs the usual median line was drawn to indicate the averages for the different speeds and then, when this had been done with no regard to mathematical accuracy, an equation was developed for the several lines so drawn, and they were found to be parabolic. This statement is made as to the method employed for the location of the lines in order to impress the fact that there was no preconceived idea as to their form. From this it appears that the records indicate that the total average increase of pressure on curves of all of the engines tested increases in the ratio of the equation of the parabola

$$y^2 = 2\ p\ x.$$

in which

y = the speed in miles per hour.
x = the lateral thrust in pounds.
$2\ p$ = a constant which varies with the locomotive and the curve.

This holds for each of the engines. The rate of increase of pressure with the increase of speed also varies inversely with the value of $2p$. The value of $2p$ was determined for the curves given in the manner indicated, and for the Consolidation and Pacific types was found to vary nearly as the squares of the radii of the curves.

$2p$ = .03652 for the Consolidation on the 6 deg. 12 min. curve.
$2p$ = .02304 for the Consolidation on the 8 deg. 7 min. curve.
$2p$ = .09375 for the Pacifics on the 6 deg. 12 min. curve.
$2p$ = .056 for the Pacifics on the 8 deg. 7 min. curve.

These curves could not be plotted for the Mikados and Ten-wheelers on the 8 deg. 7 min. curve because of insufficiency of records, but inasmuch as the median lines for the 6 deg. 12 min. curve are parabolic* there is no reason why those for the 8 deg. 7 min. curve should not be of the same character. If the conclusions drawn from those of the Consolidations and Pacifics are accepted the curves for the Mikados and Ten-wheelers for the 8 deg. 7 min. curve can be readily calculated.

The value of the constant $2p$ varies with each type of engine, and the less this value the more rapid is the rise of lateral thrust with the speed. For example, the thrust on the Consolidations with a value of $2p$ of .02304 rises much more rapidly than it does on the Pacifics where the corresponding value is .056.

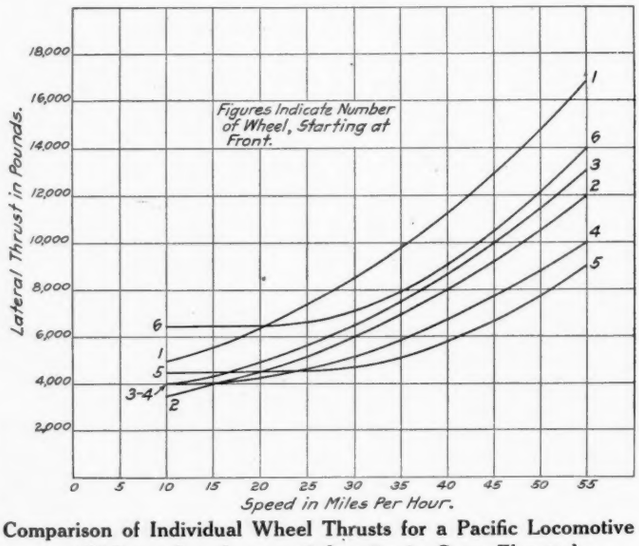
This then serves to gage the relative intensity of the lateral thrust imposed by the several types of locomotives tested. According to it they stand in the following order, taken from the data obtained on the 6 deg. 12 min. curve:

Consolidation	$2p$ = .03652
Ten Wheel	$2p$ = .06562
Pacific	$2p$ = .09375
Mikado	$2p$ = .10866

There is not sufficient data to warrant a similar arrangement on the 8 deg. 7 min. curve.

The actual location of the curves on the diagrams are, however, modified by the locations of the directrix, which varies from 11,800 for the Ten-wheelers to 17,750 for the Mikados. This does not essentially change the relationship of the curves as given above.

If the total lateral thrusts of the several locomotives rise on a



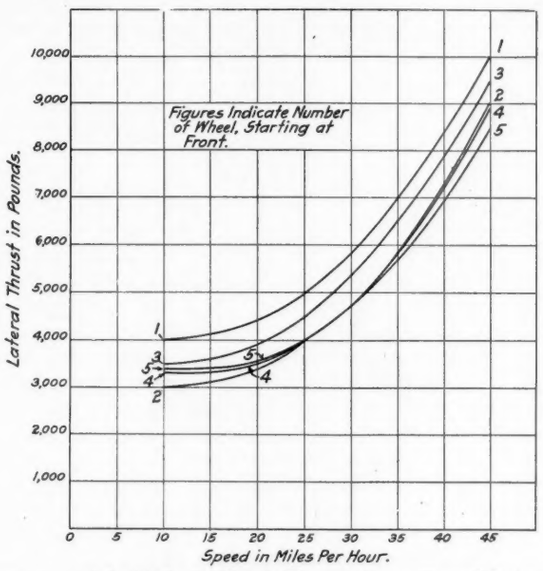
Comparison of Individual Wheel Thrusts for a Pacific Locomotive at Different Speeds on an 8 deg. 7 min. Curve Elevated for a Speed of 21.3 Miles Per Hour

parabolic curve it is fair to presume that the same is true of the lateral thrusts of the individual wheels. In order to ascertain how this would work out the individual wheel thrusts of the Consolidation and Pacific locomotives have been plotted for both the 6 deg. 12 min. and 8 deg. 7 min. curves, and approximately median lines have been drawn through these in the form of parabolas, which are substantially accurate. In each case the sums of the ordinates of these curves are equal to the corresponding ordinates of the curve for the total thrusts. This was not done for the Mikados and Ten-wheelers, because of the small number of records obtained. These individual wheel record curves have also

* As roughly determined in the manner described above.

been brought together for each curve and locomotive, from which a comparison of the relative average intensity of the thrusts of the individual wheels can be made.

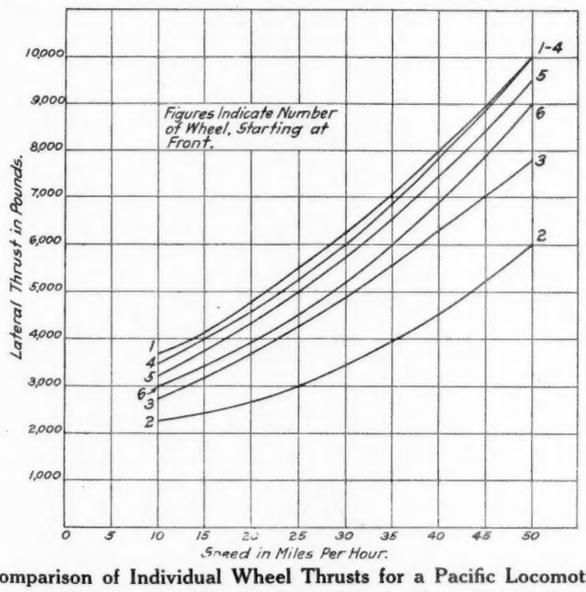
In the case of the Consolidation locomotives on the 6 deg. 12 min. curve the front truck wheel stands clearly out as exerting the maximum thrust on the rail, followed by the third wheel which



Comparison of Individual Wheel Thrusts for a Consolidation Locomotive at Different Speeds in a 6 deg. 12 min. Curve Elevated for a Speed of 24.4 Miles Per Hour

is the second driver. This is in exact accord with the results obtained on the Pennsylvania a number of years ago. The other three wheels reverse their relative positions in rising from slow to high speed and it is interesting that they come together at a speed which is approximately that for which the track is elevated.

On the 8 deg. 7 min. curve the same general order prevails, except that it is complicated by an evident binding of the rear



Comparison of Individual Wheel Thrusts for a Pacific Locomotive at Different Speeds on a 6 deg. 12 min. Curve Elevated for a Speed of 24.4 Miles Per Hour

driver. In this, too, it will be seen that the thrusts of the second and fourth drivers are about the same at a speed approximating that for which the outer rail was elevated (21.3 miles an hour).

In the case of the Pacific locomotives on the 6 deg. 12 min. curve, the average maximum thrust was exerted by the leading truck with the second truck wheel the lowest of the six. The order of average maximum thrust, taken in the wheels counting from the front, is 1, 4, 5, 6, 3, 2, and this order is preserved throughout the whole range of speeds.

On the 8 deg. 7 min. curve the order of wheel thrusts is 1, 6, 3, 2, 4, 5. The reason for this change may have been due to a binding of the wheelbase, due to the sharpness of the curve, or the low center of gravity of that portion of the engine over the trailing truck. I am inclined to attribute it to the latter cause. Throughout the whole of the tests on this curve the excessive thrust put on the rail by the trailing truck wheel was very apparent, when compared with the rear driver. It was the rule, to which there are a few exceptions, that the trailing truck wheel put a thrust on the rail in excess of that imposed by the rear driver.

LATERAL THRUST OF WHEELS ON RAILS, TENDERS AND CARS
On 6 Deg. 12 Min. Curve Elevated for 24.4 Miles Per Hour

Direction	Speed in Miles per Hour	Train Engine No.	Car or Tender	Individual Wheel Thrust in Lbs.
E	11.5	5013	Freight	3,600 to 4,400
W	25.0	5018	Tender	4,750
"	30.0	3836	Freight	6,000
"	30.0	3809	Freight	5,375
"	33.3	3886	Sleeping	9,250
"	37.5	2510	Sleeping	7,125
"	37.5	1206	Sleeping	10,375
"	38 est.	3836	Sleeping	12,250
"	40.0	3809	Tender	[1]5,300; [2]6,435; [3]7,150; [4]5,470
"	41.4	3807	Tender	[1]7,125; [2]7,750; [3]7,250; [4]6,000
"	42.8	2508	Tender	6,000
"	42.8	2510	Sleeping	8,000
"	42.8	2508	Sleeping	9,250
"	42.8	1206	Sleeping	9,875
"	42.9	3837	Sleeping	5,375
"	42.9	3837	Tender	4,125
"	44.4	2508	Tender	7,750 to 7,125
"	44.4	2508	Sleeping	10,375
"	46.1	2508	Sleeping	10,100
"	46.1	2509	Tender	4,700
"	46.2	2508	Sleeping	11,000
"	50.0	724	Sleeping	9,875
"	50.0	2793	Sleeping	11,000

E = East. W = West.

LATERAL THRUST OF WHEELS ON RAILS, TENDERS AND CARS
On 8 Deg. 7 Min. Curve Elevated for 21.3 Miles Per Hour

Direction	Speed in Miles per Hour	Train Engine No.	Car or Tender	Individual Wheel Thrust in Lbs.
W	22.2	5018	Freight	7,125
"	24.0	3917	Freight	9,250
"	24.0	3889	Freight	4,750
"	24.0	3809	Tender	13,250
"	24.2	3470	Freight	7,750
"	25.0	5015	Freight	12,000
"	26.1	3899	Freight	9,250
E	26.1	2510	Sleeping	9,875
W	27.3	724	Tender	8,750
"	27.3	724	Freight	8,750
"	30.0	5017	Freight	13,000
"	30.0	3889	Freight	10,375
"	35.3	3809	Freight	18,200
"	35.3	1018	Tender	10,750
"	35.3	3889	Tender	4,750
"	37.5	3894	Tender	11,000
"	37.5	3950	Tender	13,375
"	37.5	5015	Tender	19,250
"	37.5	3887	Freight	21,450
"	37.5	5015	Freight	26,750
"	37.5	3950	Sleeping	13,750
"	40.0	2510	Sleeping	22,500
"	40.0	2510	Sleeping	11,000
"	42.8	2510	Sleeping	21,425
"	42.8	1206	Sleeping	14,625
"	42.8	2508	Tender	[1]2,500; [2]6,500; [3]6,000; [4]3,000
"	42.8	2508	Baggage	[1]6,000; [2]4,750; [3]3,000
"	46.1	3894	Tender	22,500
"	46.2	2510	Sleeping	15,525
"	50.0	1226	Sleeping	32,125
"	50.0	2508	Sleeping	19,275 to 24,625
"	50.0	1206	Sleeping	29,400
"	50.0	2510	Sleeping	36,400
"	50.0	2508	Tender	6,750
"	50.0	1226	Tender	12,500
"	50.0	2508	Sleeping	19,300
"	54.4	2508	Sleeping	17,150 to 29,450
"	54.4	5017	Freight	33,200
"	54.5	2508	Tender	9,250
"	54.5	2508	Sleeping	21,400 to 33,200

E = East. W = West.

In addition to the locomotive records a number of records were taken of tenders, freight cars and sleeping cars. These must, however, be considered as indicating possibilities rather than average results. From the thrusts on the 6 deg. 12 min. curve it will be seen that the three classes of vehicles are grouped very closely together without much difference between them; but, on the 8 deg. 7 min. curve, the sleeping cars exerted the heaviest thrust, followed by the freight cars and tenders in the order named. I think the position of the tenders in this regard is due

to the fact that the work was done only 13 miles from the division terminal, that the run was mostly down grade, requiring the consumption of very little water and fuel, and that, as a result, the center of gravity was high when the records were obtained.

As for the sleeping cars, the thrusts, which are for individual wheels, were invariably higher than those imposed by the locomotive at the head of the train—a comparison will show that they are from two to three times as much. This cannot be attributed to low center of gravity because, if that of the one car measured is taken as an average height of the other cars, it will be seen to be considerably higher than that of any of the locomotives. The fact, however, remains that the lateral thrust put on the rails by sleeping cars is considerably in excess of that imposed by the locomotives.

In addition to the above a few records were obtained from Consolidation locomotives running backwards, and of switching engines. These records emphasized very distinctly the excessive lateral thrust imposed when there is no guiding truck. For example, at 18.8 miles an hour we have a maximum of 10,375 lbs. for a Consolidation locomotive running backwards, as against 7,125 running forwards. At 19.4 miles an hour we have 13,000 lbs. and 6,000 lbs., and at between 28 and 29, and at 31.6 miles an hour we have 12,000 and 13,000 lbs. as against from 7,000 to 9,000 lbs. Thus a Consolidation locomotive running backwards puts a maximum lateral thrust on the rails about 50 per cent. in excess of that imposed by the same locomotive running forwards.

These records cannot, of course, be taken as comprehensive enough to base a final conclusion on, but their general trend is sufficiently consistent to indicate a probability. They do show, however, that no predication can yet be made of the performance of any individual locomotive on a curve. The total thrust of the locomotive, as well as the individual wheel thrusts, is evidently dependent to a great extent on the way in which the locomotive enters and passes the curve, though of this we have no information. Apparently the amount of lateral play in the axle boxes has an influence tending to increase the thrust, but the information is too meagre to warrant the statement as a fact. There are indications also that the lateral thrust is greater when the engine is using steam than when it is not, but the data on this point is still too meagre to serve as a basis for a final conclusion. As for the effect of the height of the center of gravity, that of all of the engines tested was too nearly alike to warrant any inferences regarding it. I can only say that when these results are compared with others obtained elsewhere, they show that the lateral thrust is increased as the center of gravity is lowered. Finally the ratio of average increase of thrust along the lines of a parabolic curve, cannot be regarded as having been proven, but the method by which the curves were drawn indicates that pressures do not tend to increase directly as the square of the speed, but by that square as modified by a constant which is itself a function of the radius of curvature.

In developing the equation for the parabolic curves indicative of the wheel thrust it was found that the directrix did not lie at the base or zero of pressure, but at a considerable distance above it, nor was the axis on the zero line of the speed, but at one side, usually to the right. Hence in order to determine the locus of any particular point of the parabola a constant must be added that varies with the type of engine and the radius of curvature. It follows, therefore, that, accepting the equation as correct, the value given for the lateral thrust for low speeds will be higher than that usually obtained by the use of the centrifugal formula. If, however, the centrifugal formula

$$F = \frac{Wv^2}{g\,R}$$

in which

F = Centrifugal force.
W = Weight in lbs.
v = Linear velocity in feet per second.
R = Radius of curvature.

be used for the calculation of the stresses imposed and the effect of the elevation of the outer rail be disregarded, it will be found that this will give results below the experimental parabola for low speeds, and above it for high speeds, and that the two lines will cross at a point near, but somewhat above, the speed for which the track is elevated.

In other words the resultant thrust of the locomotive on the outer rail does not follow the formula for centrifugal action, because it is not a freely rotating body, but has its action modified by the binding of the wheels and flanges on the rails, the height of its center of gravity and other details as to the precise influence of which we have no knowledge.

A TRAIN DESPATCHER AS A REVENUE SOLICITOR

By J. L. Coss.

There is a large field in which the train despatcher, in an indirect way, can materially aid in the solicitation of business. At stations where only one man is employed, he performing the duties both of agent and operator, there are times when, if he could be excused from the office a while he would be able to secure some business, but he is in duty bound to remain at the office to take train orders. The despatcher by a little advance figuring could arrange his work to accommodate these agents in this direction and give them a chance to see shippers and prospective passengers. A little trip into the country in the afternoon or early evening might secure some emigrant outfit or a number of passengers for a long haul. The agent having made his request for this opportunity the despatcher, very likely, by arranging to use some other office, perhaps by holding a man on duty a few minutes extra, can arrange it all around.

Suppose an agent calls up the despatcher and says that some influential citizen of his town has just been called away on some important matter, or by sickness, and wishes to take the fast train, which does not stop at that particular place. Stopping the train will keep him from driving to a station on some other line. If no one higher in authority is within call, don't wait two or three hours to find out if it will be all right; take a chance; stop the train. Have the agent and the passenger understand that this is not establishing a precedent. Then make an explanatory note to the chief despatcher and he can lay it on the superintendent's desk. You may have secured a nice little bit of revenue for the road at some future time. In case of emergency give a man a permit to ride on a freight train; he will appreciate it and no doubt repay you many times in the way of shipments.

Despatchers who have families will frequently hear of prospective travelers or movers. When this comes to your ear get the word to the agent or traffic representative. In the course of social correspondence we often hear of people who are contemplating a trip. Suppose it be in St. Louis; why can't we drop our representative in that city a postal card? When your wife or daughter comes home from the club ask who is going away or who is going to have visitors.

When traveling and coming in contact with other people on the train bring up the subject of travel and learn what business your fellow passenger is in; he may be a big shipper. After you get the desired information explain to him the advantages of your road.

In conversation with any one don't unravel to them any trouble the road has experienced; always tell them of the good engines, fine cars, excellent dining service, fast freight and passenger trains, good road bed, rarity of accidents and loyalty of employees. This will be a good advertisement for the road and, no doubt, some one will get the idea that he ought to give it a trial, even if it be a few miles out of his way.

In the elections, vote for the man who will favor the railroads regardless of your politics. If the little town elects a town marshal who will see that the children are not allowed to play around the station and hop trains, keep trespassers off the right of way and promote law and order generally, he is the man to vote for.

The despatcher's work is confining and the majority of us are satisfied to plod along and not reach out very far; but why not take another view of the situation and lend a hand?

The Interstate Commerce Commission's Report on Rock Island

Commission Reviews History of the Rock Island; Condemns Severely the Policy of Controlling Syndicate

The Interstate Commerce Commission on the afternoon of August 17, gave out its report which is signed "By the Commission," "In re financial transactions, history and operations of the Chicago, Rock Island & Pacific Railway Co." The report, a very full abstract of which is printed below, is the result of hearings on various dates from April 24, 1914, to June 5, 1915. In the abstract the exact language of the commission has been preserved with a few slight exceptions.

In 1902 the main line of the Chicago, Rock Island & Pacific Railway Company extended from Chicago to Denver, with branch lines to St. Paul, Minneapolis and Kansas City. The territory served is one of the richest and most prosperous in the country and the system's ramification of branch lines insures to it a large volume of tonnage. It was then thriving and its prospects were promising, its stock selling in the markets of the world at more than $200 a share. In 1914 the shares had fallen to $20 and the road is now in receivers' hands. The evidence shows that the earnings of the railway company have steadily increased, and that in 1914 they were the largest in its history.

The results of the management, which is the subject of this investigation, may be seen from the statement above made as to the market value of the stock, and from the table below, showing the capitalization, indebtedness and operating accounts for the years 1901 and 1914:

	1901	1914
Capital stock	$49,921,400.00	$74,995,122.50
Funded debt	63,538,000.00	235,246,000.00
Loans payable	None.	3,500,000.00
Operating revenue	26,075,574.00	65,848,258.00
Operating expenses	17,096,066.00	49,517,948.00
Interest on funded debt	2,931,980.00	9,934,169.00
Rentals	473,962.00	1,881,651.00
Net income	5,306,519.00	395,915.00
Surplus	10,263,184.55	6,264,208.84
Mileage owned	3,128	5,367
Mileage operated	3,772	7,729

SYNDICATE CONTROL.

In 1901 Daniel G. Reid, W. H. Moore, J. H. Moore and W. B. Leeds purchased about $20,000,000 of stock of the company, and by the use of proxies they soon became members of the board of directors, W. B. Leeds being made president and D. G. Reid chairman of the executive committee. This syndicate procured the selection of other members of the board of directors, notably F. L. Hine, George McMurtry, and George T. Boggs, each of whom apppears to have acted and voted in accordance with the wishes of the members of the syndicate. One other director stated that he knew but little of what was being transacted in the affairs of the railway company, and that he was a member of so many other boards of directors that he had no opportunity to examine into things for himself, but had to take the word of those in authority. Thus the syndicate controlled the board through the directorships held by themselves and by those subject to their wishes.

At a stockholders' meeting held June 5, 1901, at which an increase of the capitalization of from about $50,000,000 to approximately $60,000,000 was authorized, W. H. Moore was elected a director of the company, and at a directors' meeting held on the same date Daniel G. Reid was also elected a director. At the former meeting a 10 per cent. stock dividend was declared. On July 31 W. B. Leeds was elected by the board a director to succeed W. A. Nash, resigned.

On October 24 the articles of incorporation of the railway company were amended to provide for an executive committee to consist of the president and six directors, to be designated by the board, and to be invested with all of the powers of the board when it was not in session. W. H. Moore and W. B. Leeds were appointed on this committee on the day it was created, and on December 12 following W. B. Leeds succeeded W. G. Purdy as president of the railway company. Then D. G. Reid became a member of the executive committee and J. H. Moore a member of the board. On January 30, 1902, J. H. Moore was elected by the board to the executive committee in place of H. R. Bishop, resigned. The other members of the executive committee at this time were R. R. Cable, Marshall Field and A. R. Flower.

On June 4, 1902, the capital stock of the railway company was increased to $75,000,000 and the board authorized President Leeds to sell to certain individuals portions of this increased stock at par, although at the time the stock was quoted on the market above 175.

In July, 1902, the syndicate organized two holding companies, the Chicago, Rock Island & Pacific Railroad Company of Iowa, and the Rock Island Company of New Jersey. The railway or operating company will be referred to hereinafter as the railway company, and the holding companies as the Iowa company and the New Jersey company, respectively. The St. Louis & San Francisco Railroad Company will be referred to as the Frisco.

The authorized capitalization of the Iowa company was $125,000,000 in stock and $75,000,000 in 4 per cent. collateral bonds. That of the New Jersey company was $150,000,000 in stock, of which $54,000,000 was preferred and $96,000,000 common. In the latter company the preferred stock only had voting power to elect directors of the first class, which directors under the by-laws constituted a majority of the board. The directors of these two corporations first elected were merely figureheads, but later members of the syndicate became directors of both companies and controlled them. The New Jersey company and the Iowa company each issued their stock as fully paid, whereas no payment was made on either. Then upon motion of D. G. Reid, the Central Trust Company, of New York, of which J. N. Wallace was and is president, was selected as trustee, and an arrangement was made with that company whereby the entire bond issue of the Iowa company and stock issue of the New Jersey company were placed with it under an agreement that they were to be exchanged for stock of the railway company in the proportion of $100 in Iowa company bonds and $70 in preferred and $100 in common stock of the New Jersey company for each $100 in stock of the railway company, or $270 face value of the holding company securities for each $100 par value of the railway company stock. Under this agreement the members of the syndicate deposited railway stock as follows:

D. G. Reid	$5,915,437.50
W. H. Moore	6,118,975.00
J. H. Moore	3,059,262.50
W. B. Leeds	5,597,100.00

making a total of $20,690,775, for which they received $20,690,775 in the Iowa company's bonds and the same amount in the common and $14,483,542 in the preferred stock of the New Jersey company, at total of $55,865,092.

The 10 per cent. stock dividend declared by the railway company on June 5, 1901, had the apparently intended effect of creating a demand for the stock of the holding companies, the only revenue of which was from dividends on the stock of the railway company and practically all of the stockholders of the railway company exchanged their stock, the total amount deposited being approximately $71,000,000, or all but about $4,000,000 of the total railway stock. The par value of the holding companies' securities issued in exchange amounted to about $191,000,000.

Under the terms of the trust agreement the railway stock deposited was to be held by the trust company as collateral

to secure the Iowa company's bonds, and the trust company was authorized to sell the railway stock upon default of payment of interest on any of the bonds.

Thus by the organization of the two holding companies the syndicate, the members of which held but little more than one-fourth of the railway stock, secured control of and dominated the affairs of this transportation system.

A significant transaction at this time is that growing out of the action of C. H. Venner, a stockholder of the railway company. He made demands upon the officers of the railway company in December, 1902, and in January, 1903, for a list of its shareholders. Being ignored, he instituted on January 31, 1903, a proceeding in a state court of Illinois to enjoin the organization of the holding companies and the exchange of railway company stock for their securities. In February and March, 1904, the railway company paid Venner $291,000, ostensibly in consideration of his delivery to it of securities of the New Jersey company and of the railway company valued at $91,000 and stock of the Nebraska Central Railway and of the Nebraska Construction Company of a nominal value of $200,000. Thereupon the suit to restrain the holding companies' plan was dismissed. Neither the Nebraska Central Railway Company nor the Nebraska Construction Company had any road or other tangible assets, and their stock is therefore considered to be without value. The conclusion is obvious that the payments to Venner were in consideration of his refraining from further prosecuting in the courts his opposition to the syndicate plans. The railway company incurred in this litigation expenses amounting to about $17,000.

The expense of incorporating the holding companies, $218,000 for the Iowa company and $120,000 for the New Jersey company, was paid by the railway company, but these amounts were returned to it three years later without interest, the necessary funds having been secured by the holding companies from dividends on the stock of the railway company.

Practically the entire expense of renting, fitting up and furnishing the quarters occupied by the holding companies for the first four years of their existence was sustained by the railway company. During the next four years, or until 1910, the proportion of this expense borne by the holding companies was slightly increased, the balance being distributed between the railway company, the Frisco, the Chicago & Eastern Illinois, the Evansville & Terre Haute Railroad, and the Chicago & Alton. From 1910 to 1914 the expenses of the offices were prorated on the basis of 50 per cent. to the railway company, 37½ per cent. to the New Jersey company, and 12½ per cent. to the Iowa company. On the basis of apportionment adopted in 1910, the overcharge paid by the railway company prior to that year would amount to approximately $290,000. That amount was improperly diverted from the treasury of the railway company.

SALARIES OF AND CONTRIBUTIONS TO OFFICERS AND DIRECTORS

The salaries paid to some of the principal officers at various periods were as follows:

	Per annum.
H. U. Mudge, president	$60,000
L. F. Loree, chairman executive committee (one-half to be paid by the Frisco)	75,000
R. A. Jackson, vice president and general solicitor	50,000
R. R. Cable, member of board of directors	32,000
W. B. Leeds, president	32,000
B. L. Winchell, president	40,000
B. F. Yoakum, chairman executive committee	30,000
Daniel G. Reid, chairman board of directors	32,000
C. H. Warren, first vice president	35,000

W. G. Purdy, upon his retirement from the presidency, was given two years' salary at $22,500 per annum.

Mr. Mudge, president of the railway company and now one of the receivers, asserted that the troubles of the railway were in a measure due to increase of wages and governmental regulations. When asked what wages he referred to as being increased he pointed out the wages of clerks, telegraph operators, conductors and brakemen. While he regarded the wages of these minor employees as having partially sapped the financial strength of the railway, he declared that the salaries paid to the higher officers of the company had no appreciable effect on its expenses.

It appeared to be the idea of those in control of the railway that it was no concern of the public what became of the corporate funds so long as rates were reasonable. Those stating this opinion apparently did not take into consideration the fact that if the funds derived from transportation services are expended wastefully or corruptly the inevitable result must be either increased charges in order to enable the railway compnay to obtain money to pay operating expenses, or bankruptcy.

The contributions to officials of the railway company in excess of their salaries aggregated about a million dollars.

THE ST. LOUIS & SAN FRANCISCO

On May 6, 1903, an agreement was executed between the Iowa company, the New Jersey company, and J. P. Morgan & Company, wherein it was agreed that the common stock of the Frisco would be exchanged for securities of the Iowa and New Jersey companies.

The terms of the agreement provided that for each share of the common stock of the Frisco there would be exchanged $60 par value in 5 per cent. bonds of the Iowa company and $60 par value of the common stock of the New Jersey company. Pursuant to this agreement Frisco common stock in par value of $28,940,300 was exchanged for securities of the Iowa and New Jersey companies in par value of $34,728,360, equally divided between stocks and bonds.

The Frisco stock thus exchanged was deposited as collateral for the bonds of the Iowa company, and in December, 1909, was resold to B. F. Yoakum for $37.50 a share, or $10,852,000. This amount was insufficient to redeem the Iowa company bonds, which was necessary in order to make delivery of the Frisco stock, and the Iowa company, having no resources, issued to the railway company its bonds, which now appear to be worthless, to an amount in par value of $7,500,000 and received therefor $7,300,000 in cash, the net proceeds from a loan of $7,500,000 made to the railway company by the First National Bank of New York. Of these bonds $1,388,000 were subsequently retired, leaving in the possession of the railway company $6,112,000, which the Iowa company has no assets to retire. The latter amount was thus taken from the treasury of the railway company to meet an obligation of the Iowa company for which the railway company was in no way responsible and from which it derived no apparent benefit.

The final result of this transaction is that the railway company has sustained a loss estimated to be about $6,500,000.

CHICAGO & ALTON.

In November, 1903, an account styled "B. F. Yoakum advances" was opened on the general ledger of the railway company to cover amounts advanced by it for the purchase of stock of the Chicago & Alton, hereinafter referred to as the Alton company.

As a result of transactions in the Alton stock the railway company acquired 48,800 shares of preferred and 144,200 shares of common at a total cost of $9,709,876.49. These shares were bought principally in 1903, but sundry purchases were made after that time until June 30, 1907, when the above total amount had been accumulated.

In October, 1907, the railway company delivered to the Toledo, St. Louis & Western 41,100 shares of the preferred and 144,200 shares of the common stock of the Alton company, receiving in exchange for the former 4,110 series "A" $1,000 bonds and for the latter 5,047 series "B" $1,000 bonds of the Toledo, St. Louis & Western.

On November 28, 1908, the executive committee of the railway company authorized the sale of the remaining shares of the preferred stock of the Alton company held by the railway company, together with sundry bonds, series "A" of the Toledo, St. Louis & Western Railroad Company. Pursuant thereto, 3,220 shares of the Alton preferred were sold at a loss of $45,527.69, and the sale of 3,710 of the series "A" bonds of the Toledo, St. Louis & Western resulted in a loss of $393,572.44.

On June 30, 1914, the railway company owned 400 series "A" and 5,047 series "B" bonds of the Toledo, St. Louis & Western,

and 4,500 shares of Alton preferred, which in the aggregate had cost it $6,193,240.36, whereas on the date named their market value was $1,582,400, a difference of $4,610,840.36. In addition, the money with which the Alton stock was originally purchased was secured from the sale of bonds, the interest on which to June 30, 1914, less dividends on the stock and interest on the bonds secured, amounted to $1,320,644.76.

From the foregoing it will be noted that the total loss sustained by the railway company as a result of the disastrous Alton deal was approximately $6,370,000.

TRINITY & BRAZOS VALLEY.

A contract was entered into under date of March 31, 1906, between the railway company, the New Jersey company, the Colorado & Southern, and the Frisco. The last-named carrier's participation was only to the extent of through traffic arrangements. The cost of construction of the Brazos line, which is practically the entire line of the Trinity & Brazos Valley Railway, was borne by the Colorado & Southern, and under the terms of the contract the latter company and the railway company were to share equally the profits or losses of the Trinity & Brazos Valley, and on May 1, 1935, the railway company was to pay to the Colorado & Southern one-half of the entire cost of the Brazos line, receiving in return one-half of the bonds of the Trinity & Brazos Valley and one-half of other evidence of debt included in the total cost of the Brazos line. The contract further provided for the delivery to the New Jersey company of one-half of the stock of the Trinity & Brazos Valley, the former to make payment only of such amounts as are defaulted by the railway company.

A supplemental contract was entered into on June 1, 1914, wherein the railway company and the Colorado & Southern release each other from the obligation to make any further payments to or for account of the Trinity & Brazos Valley, and the railway company agrees to pay to the Colorado & Southern one-half of the interest at the rate of 4½ per cent. per annum on the total cost of the Brazos line to May 1, 1935. The total cost of the Brazos line approximated on June 30, 1914, $11,000,000.

In accordance with these agreements the railway company advanced to June 30, 1914, to and for the account of the Brazos line, $3,729,863.87. For all but $35,000 of this the railway company holds certificates of indebtedness of the Trinity & Brazos Valley, on which there has accrued unpaid interest charges of $774,918.20. The total investment of the railway company, therefore, is $4,504,782.07, and in view of the fact that the Trinity & Brazos Valley is now in the hands of a receiver and the operation of its property has for some time resulted in a deficit, it appears that this investment is of very doubtful value.

OTHER LOSSES

As a result of coal deals the company had a total loss of more than $1,300,000. If the advances to the coal companies can not be collected, it will result in an additional loss of nearly $2,500,000.

On April 11, 1902, the executive committee of the railway company authorized the president and secretary of that company to engage with Speyer & Company, New York bankers, to assume a contract previously entered into between that firm and the Choctaw, Oklahoma & Gulf covering the purchase of the stock of the latter company.

Whether or not a loss has been sustained by the railway company as a result of this transaction is not demonstrable for the reason that the accounts of the carrier are not kept in such a manner as to permit the segregation of items by corporate lines. There is abundant reason to believe, however, that the disbursements made by the railway company in acquiring the Oklahoma company are far in excess of the actual value of the property and disproportionate to the returns accruing from the investment therein.

The Rock Island Improvement Company, incorporated under the laws of the state of New Jersey, is primarily a creature of the holding companies, designed to acquire on behalf of the railway company transportation equipment and other facilities.

As an incident to these transactions, the railway company in one instance at least sold bonds of the improvement company at less than par and six months later bought them back at more than par, notwithstanding the general tendency of bonds to approximate par as they approach maturity. The only justification offered by its sponsors for the existence of the improvement company is that by means of its operations the equipment of the railway company is exempted from the lien of a bond issue of 1898 covering all property then held by the railway company or subsequently acquired by it or its successors.

In the absence of specific figures it is impossible to determine the difference between the ultimate cost of equipment furnished the railway by the improvement company and what such cost would have been had such equipment been purchased directly by the railway company, but it is plain that the procedure entailed an added cost, and that to that extent the railway company sustained a loss by reason of its affiliation with the improvement company.

AGGREGATE OF LOSSES

The aggregate losses sustained by the railway company in connection with the foregoing transactions may be summarized as follows:

Expenses of maintaining and housing holding companies, more than	$290,000.00
Frisco deal, approximately	6,500,000.00
Alton deal, approximately	6,370,000.00
Trinity & Brazos Valley Railway deal, more than	4,500,000.00
Consolidated Indiana and Dering coal companies, at least	1,300,000.00
Contributions or gratuities to officers and directors, about	1,000,000.00
Venner transaction	217,000.00
Miscellaneous and unexplained expenditures	72,523.45

These items show an aggregate loss to the railway company of more than $20,000,000. In addition thereto it is to be noted that prior to June 30, 1914, the railway company paid to financial institutions, in connection with the issuance of bonds, commissions aggregating more than $1,600,000, and suffered discounts of more than $17,700,000.

INDIVIDUAL PROFITS

The amount of gains accruing to W. B. Leeds, D. G. Reid, W. H. Moore, and J. H. Moore through their control and manipulation of the railway company are probably not ascertainable. Reid, when interrogated with a view to ascertaining his profits from the various transactions, explained that he always burned his books at the end of each month.

The quotations placed in the record from the stock market of the New Jersey company stock and the railway company stock showed wide fluctuations. Whatever have been the gains realized by these persons, it is certain that the present holders of the stocks and bonds of the holding companies have that which is of little or no value.

REPORTS TO STOCKHOLDERS

Misrepresentation of assets in reports to stockholders appears to have been a practice of the directors of the railway company. On June 30, 1904, a book surplus was claimed for the railway company of $22,343,955.26. By June 30, 1914, the company conceded a reduction of this surplus to $6,199,841.08, and even this amount was fictitious.

Thus the railway company included among its assets certificates of indebtedness of the Trinity & Brazos Valley carried at a book value of $3,694,863.87. The Trinity & Brazos Valley was then in the hands of a receiver and was already facing a deficit of $8,000,000, with a practical certainty that this amount would increase from year to year. It is apparent, therefore, that this item of more than $3,500,000 was based upon securities which were known to be practically worthless.

In view of the fact that the reported value of the "securities" listed for the year 1914 was nearly $18,000,000 in excess of their actual value, instead of a surplus of more than $6,000,000 claimed by the railway company, there should have been shown a deficit of over $11,600,000.

Another misleading and objectionable practice of the railway

company officials was the failure to state on the pay roll the true amounts paid to its officers.

The publication of misleading reports to stockholders can not be too severely condemned, and the individuals guilty of such acts should be subject to adequate penalties.

PRESENT STATUS OF THE RAILWAY

The original articles of consolidation provided that the maximum of indebtedness to which the company might subject itself should not exceed two-thirds of its outstanding capital stock. This maximum has been increased from time to time until the funded debt of the railway on June 30, 1914, was $238,746,000, an increase of nearly $175,208,000 over the amount outstanding on June 30, 1901. On June 30, 1914, the total capitalization of the railway company was $313,741,000. Of this amount only $75,000,000, or 28.73 per cent, was capital stock on which dividends might or might not be paid, according as the net earnings of the company might or might not warrant. The remaining 71.27 per cent of the total capitalization consisted of interest-bearing debt, including $3,500,000 of short-term loans, on which interest was required to be paid regardless of earnings.

The Iowa company being wholly dependent for earnings upon the dividends paid by the railway company, the passing of the railway company dividends in May, 1914, resulted in a default of interest on the bonds of the Iowa company. Pursuant to foreclosure proceedings instituted on behalf of the bondholders, the United States district court for the southern district of New York ordered the sale in one block of $71,353,500 par value of the railway company stock deposited with the Central Trust Company of New York as collateral for the bonds of the Iowa company.

Some time previous thereto J. N. Wallace, president of the Central Trust Company of New York, which, it will be remembered, was trustee by virtue of the agreement between the holding companies and the railway company, having been selected upon the suggestion of Daniel G. Reid, a member of the syndicate, organized a self-appointed bondholders' protective committee, the members consisting of himself and five other men of his selection. This committee advertised extensively for Iowa company bonds to be deposited in trust with it for the benefit of the bondholders, but after five months succeeded in getting only about $23,000,000 out of $75,000,000. Under the terms of the order of the district court the purchaser of the railway stock at foreclosure was to deposit $1,000,000 in cash or $10,000,000 in Iowa company bonds. In November, 1914, the circuit court of appeals permitted N. L. Amster, of Boston, a minority stockholder in the railway company, to intervene in the foreclosure proceedings, thereby postponing the sale as scheduled. Following the decision of the circuit court of appeals an adjustment was reached with the Wallace committee in the interest of all undeposited bonds, and an order was entered by the court on December 31, 1914, pursuant to which the stock was sold to Mr. Wallace, who was the only bidder, for $7,135,350.

The syndicate decided to put the railway into a receivership. The general counsel of the railway company at the suggestion of W. H. Moore, a member of the syndicate, drew the bill asking for a receivership and engaged an attorney ostensibly to represent the other side. The bill was placed in the hands of this attorney with the name of the complainant omitted and he was instructed by the general counsel to locate some creditor of the railway company willing to act as complainant. There was an agreement between the general counsel and this attorney as to the parties the latter would recommend to the court as receivers, the general counsel agreeing to instruct the attorney appearing for the railway company to acquiesce in the recommendations so made.

The board of directors of the railway company was not informed of the intention to file a bill for receivership and at no meeting of the board was any authority ever given for such action. Members of the board of directors not in the confidence of the syndicate were kept in ignorance of the fact that such a bill had been prepared. The stockholders had no information of the purpose to put the railway company into a receivership, although a stockholders' meeting was held after the date upon which the receivership bill was completed by the general counsel, and this general counsel attended the meeting. According to the testimony, the bill was completed by the general counsel March 29, 1915, and the fact that it was to be filed whenever desired by those in authority was known only to certain insiders. The testimony clearly establishes the fact that the railway company could easily have paid the debt of $16,000 upon which the receivership application was based, and that arrangements probably could have been made to meet all pressing obligations of the railway company.

The creditor at whose instance the receivership application was filed appeared as complainant by request. R. P. Lamont, the president of the American Steel Foundries, the complainant, testified that he would not have thought of bringing such a proceeding against the railway company unless he had understood that it would be regarded as not unfriendly but as a friendly act to oblige the railway company. He only consented that his company should appear as complainant when he was assured that this course was in accordance with the wishes of the railway company and that his company was not to have any care or expense in the preparation of papers or payment of counsel fees. The suit was not a bona fide proceeding to collect a debt, but was instituted to carry out the purposes and schemes of the syndicate controlling the railway.

N. L. Amster, who was elected to the board of directors of the railway company by the minority stockholders at the stockholders' meeting held in Chicago, April 12, 1915, believing, according to his testimony, that no sincere effort was being made by other members of the board to finance the obligations of the railway, undertook to assist in raising about $6,000,000 needed by the railway to meet obligations soon thereafter to mature. On April 16, 1915, he met and conferred with Messrs. James, McLean and Schumacher, all directors of the railway and members of the executive committee, and discussed the company's finances. These three expressed approval of his purpose to negotiate for the money. Amster testified that he had secured assurances for the furnishing of the money from responsible Boston bankers on securities which the railway company had. When he arrived in New York on the morning of April 20 to report this fact he went to the office of the railway company, and, quoting his testimony, "could not find anybody there that would say anything, except a lot of people moving back and forth. I left the office and found on the ticker that the Rock Island had been put in the hands of a receiver." This, Amster testified, was the first information he had of the receivership or that such a step was in preparation, yet he was a director of the road and after the stockholders' meeting in Chicago, April 12, traveled from Chicago to New York with Roberts Walker, the general counsel of the railway company.

It will be remembered that the bill was completed by the general counsel on March 29, this fact being known only to a special few. The bill was filed April 20. The records of the New York stock market reveal that the railway stock was inactive until the day this bill was completed, March 29. Then the stock began to be largely dealt in, and the price increased from $20 to $39 a share. When the bill was filed and receivers were appointed the stock dropped from $39 to $20 a share.

It is a forceful commentary on the methods by which a great railway may be manipulated into a receivership when it is noted that the general counsel, after drawing the bill for a receivership, sold his stock, and the local counsel, who represented the railway company in the receivership proceedings, owned no stock in the railway company, and that none of those directly participating in the receivership proceedings had any financial interest in the railway company. The real owners of the railway, the stockholders, the security holders, and the directors, except those composing the syndicate and in its confidence, were in ignorance of the receivership application. Mr. Mudge, former

president of the railway company, is now one of the receivers.

The general counsel for the railway company, who planned the receivership in obedience to the will of the syndicate, is now counsel for the receivers.

The property of the railway company will be called upon for many years to make up the drain upon its resources resulting from transactious outside the proper sphere in which stockholders had a right to suppose their moneys were invested. This record emphasizes the need of railway directors who actually direct. There are too many passive directors who acquiesce in what is being done without knowledge and without investigation. A director of a railroad is a quasi public official who occupies a position of trust. A director who submits blindly to the exploitation of his company is a party to its undoing and he should be held responsible to the same extent as if he had been a principal instead of an accessory before the fact. The greater his prominence the greater his responsibility and the greater his dereliction. Obviously a man of large affairs could not attend to all the details in intricate transactions, but it is inconceivable that a director of ordinary business prudence and sagacity would sanction large expenditures without an inquiry as to the purposes of such disbursements. So long as this situation exists, however, it suggests the need of a law to charge such directors with individual responsibility for the dissipation of corporate funds.

The Clayton anti-trust act, which becomes effective October 15, 1916, will make it unlawful for any person at the same time to be a director in two or more competing corporations, any one of which has a capital, surplus or undivided profits aggregating more than $1,000,000, but common carriers are expressly exempted from its application. It should be just as grave an offense for an official of a railway to be faithless to his trust for financial gain as it is for an elected official of the government to betray his trust for money reward.

By this case the need of some limitations on the issuance of stocks and bonds by common carriers, whether directly or through holding company devices or otherwise, is again demonstrated.

REPORT ON THURMONT COLLISION

The Interstate Commerce Commission has issued a report, signed by H. W. Belnap, chief of the division of safety, dated July 30, explaining the cause of the butting collision of passenger trains on the Western Maryland, near Thurmont, Md., June 24th, when two passengers and four employees were killed and twenty-three passengers, employees and other persons were injured. This spectacular wreck, caused by the trains meeting on a high bridge, both running at fifteen or twenty miles an hour, was reported in the *Railway Age Gazette* monthly record in the issue for August 6, page 229. An abstract of the commission's report follows:

The collision occurred in broad daylight but the line approaches the bridge from both directions on sharp curves, so that neither engineman had more than a few seconds' view of the opposing train. The cause of the collision was a mistake of the train despatcher, a man of experience, with good record, in assuming that a train order, after having been superseded, could be restored by annulling the superseding order.

The despatcher first issued order No. 71, requiring the westbound train (No. 11) and the eastbound train (No. 10) to meet at Flint. Finding, afterwards, that one of the trains would be delayed, he sent order No. 74, making the meeting point Sixty instead of Flint. This advanced the eastbound train about two miles, against the westbound. Again, the eastbound train was delayed and the despatcher sent order No. 75 annulling order No. 74. This order cancelled all of the train-order meeting points between No. 10 and No. 11 and left No. 10 superior, according to the time table, to No. 11.

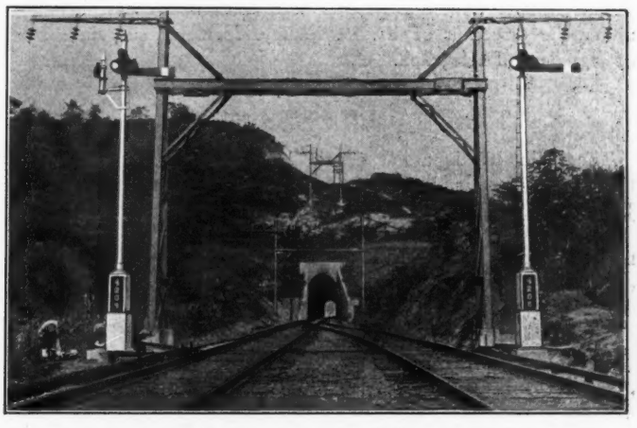
The westbound train received order No. 71, giving it the absolute right of road to Flint; but order No. 74, which was sent (for this train) to Thurmont, was annulled before train No. 11 reached that station, the annulling order, No. 75, being addressed to the operator at Thurmont. According to the order No. 75, he filed away both No. 74 and No. 75, neither being of any further effect; and so No. 11 proceeded toward Flint on the authority of order No. 71.

The despatcher said to the inspector that at the time he issued order No. 75 he was momentarily under the impression that in annulling order No. 74 he restored order No. 71 (to train No. 10); and as No. 11 had not received order No. 74, it would be unnecessary for that train to have a copy of No. 75. He was very busy with train orders and messages and did not discover his mistake until he heard of the collision. From the time he came on duty, four o'clock, until the time of the collision, 5.47 p. m., he had issued eleven train orders and had recorded sixteen acceptances of these orders. The despatcher said that he had more work than one man could properly look after, two divisions of the road having been consolidated about a year ago. Officers of the road testified that the consolidation of divisions had been justified by a simplification of the work of the despatchers. Engine failures and delays to trains had been very greatly reduced. At the time of the collision, the daily average number of train movements over the section of road where the collision occurred was twenty-two.

The report calls attention to the fact that there were three butting collisions on this road during the last three months of 1912, and that at that time the government inspector recommended the introduction of the block system. The company has installed automatic block signals on 57 miles of its line during the past year, but Mr. Belnap says that at the present rate it will be twelve years before the whole of the road will be thus protected; and, "in view of the volume of traffic, the installation of an adequate block system is urgently required."

AUTOMATIC BLOCK SIGNALS FOR GAUNTLET IN MIRAFLORES TUNNEL

During the period of construction of the Panama Canal, the trains hauling excavated material from the canal prism, and all of the regular trains of the Panama railroad, were moved through the single-track tunnel at Miraflores, under the protection of an absolute train staff system and an interlocking plant at each



Signals at Miraflores Tunnel, Panama Railroad

end. As the traffic changed toward the end of the construction period, it was possible to eliminate the interlocking at the ends and to install a gauntlet through the tunnel. It was then decided that it would be economical to replace the staff machines by automatic block signals. The tunnel is about 1,500 ft. long.

An incline had been built to a point over the tunnel for taking material up to construct a new filtration plant for the water system, and there was a material yard near the south portal of the tunnel, so that it was often advantageous to make certain movements against the current of traffic, with light engines. In addition to this, it was anticipated that it might be necessary

at some time to operate one main as a single-track. Considering these conditions, it was decided to place two automatic signals at each end of the tunnel so as to signal trains in both directions on either track. The original installation included four Union Switch & Signal Company's style B signals, operating from 0 to 90 deg. in the upper right-hand quadrant. The reverse movement signals were located to the left of the track governed (looking in the direction of the reverse movement). The circuits were arranged on the "normal danger" basis, with an approach signal located at the entrance of the clearing section, 1,500 ft. in the rear of the tunnel signals. These approach signals operated in two positions only, from 0 to 45 deg. The clearing sections for the reverse movement signals were only 150 ft. long, allowing a train traveling with the current of traffic to pass over the section in such a short time after the rear end had passed out of the gauntlet track circuit that the signal arm would not be raised from its horizontal position, even though the relay might be momentarily energized and the armature make a few revolutions.

The crossovers and switches were equipped with indicators and switch boxes, though some of the switch boxes actuate line circuits only. A crossing gong, actuated by trains running with the current of traffic, was located at the north end of the tunnel to serve as a warning to speeders and hand cars.

When automatic signals were installed through this territory recently this scheme was tied on, and all signals except the two reverse signals and the two approach signals, were made to operate in three positions.

Under the present arrangement the signals clear for trains on the "first come, first served," basis, regardless of right, class, or direction. If, for example, a second section of a train going with the current of traffic is held at one of the signals because the first section is not out of the block in advance, a train in the opposite direction will receive a proceed indication if it is standing on or has entered its clearing section prior to the time the aforementioned section enters its clearing section. This gives an even chance to trains moving in both directions, and tends to prevent congestion on either track. It also allows an engine to return for the rear end of its train after switching, and safely expedites a number of other train movements that are specially necessity in this territory. The maximum speed here is about 30 miles an hour.

This special tunnel protection was worked out and installed under the direction of W. H. Fenley, formerly superintendent of signals and telegraph.

TRAIN ACCIDENTS IN JULY[1]

The following is a list of the most notable train accidents that occurred on railways of the United States in the month of July, 1915:

DERAILMENTS

Date	Road	Place	Cause of De'r'l'mt	Kind of train	Kil'd	Inj'd
† 3.	Chc., M. & St. P.	Rainer, Wash.	Acc. Obst.	P.	3	15
7.	Pennsylvana	Ter. Park, O.	Wind.	P.	3	15
7.	Wabash	Gilmore, Mo.	Wind.	P.	0	10
9.	Atlantic Coast Line	Newark, Ga.	Malice.	P.	1	6
14.	Boston & Albany	Claverack, N.Y.	Neg.	F.	1	2
20.	El Paso & S. W.	Indiole, N. M.	Flood.	F.	5	0
28.	A., T. & S. F.	Navajo, Ariz.		F.	1	0
*29.	C., C., C. & St. L.	Grafton, O.	b. truck	F.	4	0
30.	M., K. & T.	Lockhart, Mo.		F.	2	0
31.	Raritan River	Parlin, N. J.	Malice.	P.	0	1

The train derailed on the Chicago, Milwaukee & St. Paul, near Rainier, Wash., on the third, was a southbound passenger, and the engine and two cars fell through a trestle bridge. These two cars lodged on a freight train of the Northern Pacific, which was passing beneath the trestle at the time. One passenger, the engineman and the fireman were killed and 15 passengers were injured. The cause of the derailment was the weakening of the bridge (which did not alter the appearance of the track) by a derrick in the freight train, which had become loose and swung around.

The train derailed near Terrace Park, Ohio, on the 7th, was northbound passenger train No. 8, consisting of four express cars loaded with race horses, together with a postal car, passenger coaches and sleepers. It ran into a very severe rain and wind storm near Terrace Park, north of Cincinnati, and while on a high bank ran through the path of extremely high wind, which blew the first car of the train (an express car) over the bank; and the three following cars were derailed. Three attendants with the horses were killed and fifteen injured, those killed being in the car which was blown from the track. An officer of the road writes that very careful investigation showed that the accident occurred directly in the path of the severest portion of the wind storm. The train at the time was running at about 40 miles an hour, and he has no doubt that the car was blown from the track.

The train derailed near Gilmore, Mo., on the 7th, was westbound passenger No. 9, and the cause was a tornado. The four cars of the train next the engine were blown off the track and overturned. The injuries to the passengers, numbering 10, were all comparatively slight. The train was running at about 20 miles an hour. The four cars were all blown clear of the track, and the engine and five remaining cars proceeded, after a delay of only an hour.

The train derailed at Newark, Ga., on the 9th was eastbound passenger No. 58, and the engine and one car were overturned. The engineman was killed and the fireman and five passengers were slightly injured. The derailment occurred about 2 a. m., and was caused by the malicious misplacement of a switch.

The train derailed at Claverack, N. Y., on the 14th was a westbound switching engine without cars. The engine was partly turned over and one trainman was killed and two others injured. The cause of the derailment was excessive speed over soft track, and the absence of the engineman, who was at the tender of the engine getting a drink of water and was not in a position to shut the throttle and apply the brake.

The train derailed at Indiole, N. M., on the 20th was freight No. 71, and the cause was the failure of a bridge, due to washing out of foundation by a cloud burst. The engine and ten cars fell to the gulch below, and five persons were killed, the engineman, fireman, one brakeman and two tramps.

The train derailed at Navajo, Ariz., on the 28th was an eastbound freight, and the locomotive was overturned and the engineman killed. The derailment was due to insecure track caused by abnormal rains.

The train derailed at Grafton, Ohio, on the 29th, was a northbound freight and 18 cars were badly damaged. Ten of them took fire and were burned up. Four tramps are said to have been riding on an oil tank car, the car which was the first to jump the track, and they were killed in the fire, though the body of only one person was discovered. The cause of the derailment is believed to have been a broken truck.

The train derailed near Lockhart, Tex., on the 30th, was an eastbound local freight, and the engine was overturned. Eight cars were wrecked, and the fireman and one brakeman were killed. The derailment occurred about 8 p. m., at a highway crossing, and may have been due to sand or other obstruction on the track.

The train derailed on the Raritan River Railroad, near Parlin, N. J., on the 31st of July, was express train No. 10, and the engine and one car were ditched. The engineman was slightly injured. The derailment is believed to have been caused by spikes maliciously placed on the rails.

Electric Car Accidents.—Four serious accidents to electric cars were reported in the newspapers as having occurred in the United States in the month of July, but no fatal results were expected from any one of them. At Queenston, Ontario, on the 7th, a trolley car, heavily loaded, ran away on a steep grade and eleven passengers were killed.

[1]Abbreviations and marks used in Accident List:
rc, Rear collision——bc, Butting collision——xc, Other collisions——b, Broken——d, Defective——unf, Unforeseen obstruction——unx, Unexplained——derail, Open derailing switch——ms, Misplaced switch——acc obst., Accidental obstruction——malice, Malicious obstruction of track, etc.——boiler, Explosion of locomotive on road——fire, Cars burned while running——P. or Pass., Passenger train——F. or Ft., Freight train (including empty engines, work trains, etc.)——Asterisk, Wreck wholly or partly destroyed by fire——Dagger, One or more passengers killed.

TURNING FRENCH FREIGHT CARS INTO HOSPITALS

By WALTER S. HIATT.*

On that French front of 500 odd miles, an average of 5,000 Frenchmen are killed or wounded during each 24 terrible hours of battle.

How shall the wounded be cared for? As a matter of cold-blooded calculation, sympathy aside, if this war is to go on these wounded must be saved and nursed back to health, so that they may return to the defense of their homes and their nation, and so that France, after the war, may not be a manless country. In the heat of the fighting, during the defense of a trench or in the attempt to take a trench from the enemy, a man falls, pricked by a bullet or stung in a dozen places by fragments of shell. When there is time, particularly at night, when the enemy cannot see to fire upon the life-savers, men of the hospital corps, or comrades of the fallen, crawl out beyond the trenches into the open space of No Man's Land, locate the wounded man and, still crawling, drag him back to the safety of the trenches.

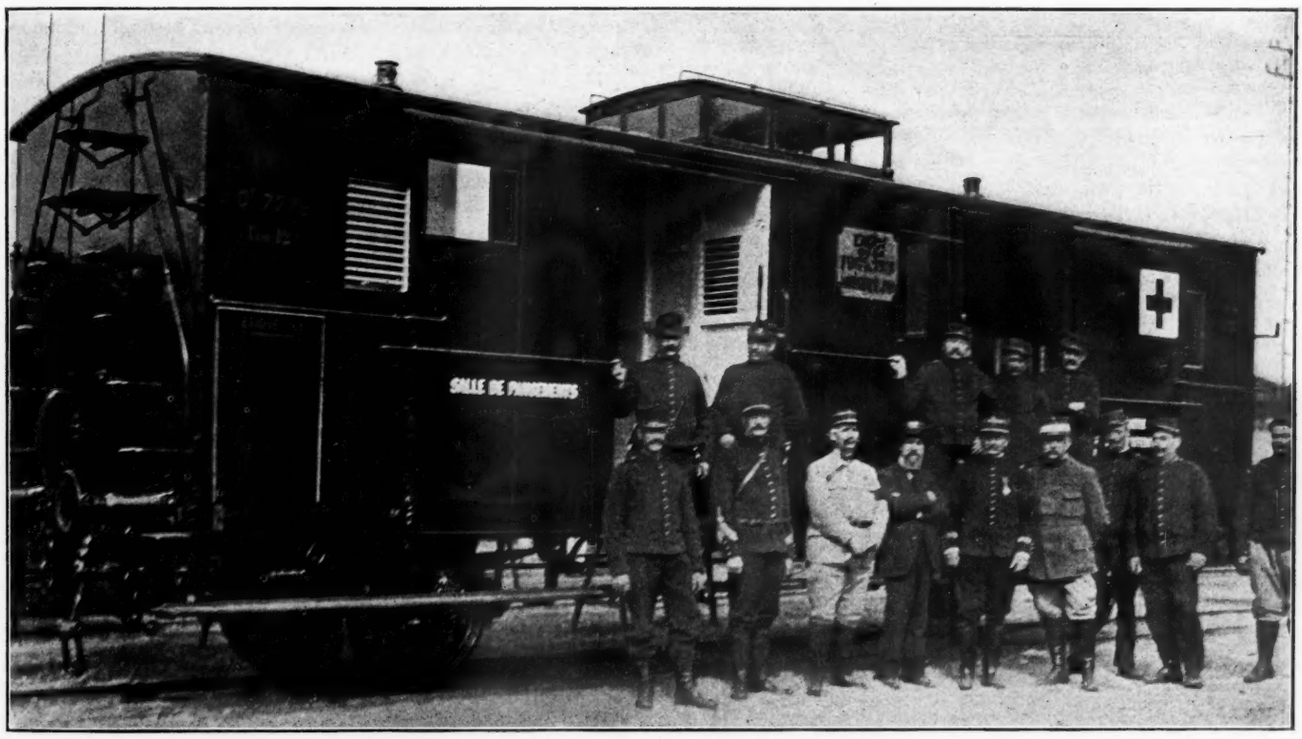
Then, by slow degrees, the wounded man is carried to the rear, always under cover of the deep ditches (boyaux) that connect with the front trenches, until a temporary hospital is found, often a mile or two from the trenches. There the man is given temporary treatment, after a time placed in a hospital wagon, and, if not so cut up that he cannot stand being moved, bundled off to the trains that are always waiting to whirl the wounded back to life, back into the heart of France, to Paris, Orleans, Bordeaux, Lyons, or to the seacoast at Toulon in the distant south, to Tours, or to St. Nazaire at the mouth of the Loire.

These trains of mercy have been running by thousands since the first month of the war, until now they have carried nearly a million men into the hospital country, and by the hospital country is meant the whole of France. Every palace, every chateau, every comfortable home, every comfortable public building, whether in the city or in the country, has been turned inside out, and made into a hospital. Every resource of the human heart, every kindness of old men, of women, of children even, is at work in this stern business of caring for the wounded that these trains deliver.

There have been many problems for the railroads to solve in caring for these wounded. This hospital work has assumed colossal proportions and out of it has grown not only a perfection of the old means of caring for wounded on the field of battle, and in the hospital, but also in their transportation. It cannot be too frequently stated that railroad men and railroads have rendered services in this war the scope and real usefulness of which are hardly yet understood; which are taken too much for granted. A soldier wounded on the Yser, in the north, may be delivered at Paris within 30 hours of the time he was wounded, if he is in condition to be moved at all.

One phase of this service has been the evolution of a life-saving hospital car out of a rude, cheap box car. In the beginning of the war, when the railroads had rendered their first great service of launching the soldiers towards the frontiers, the problem of caring for the wounded was in a state of infancy. A great deal of ink has been wasted about the value of field hospitals. The only hospital in which a seriously wounded man can be treated effectively is one in a building away from the heat, the noise and the hurry-scurry of the camps. The only way to get the soldiers to those hospitals, when there are so many thousand to handle, is by train. Before the war there was scarcely any provision for the sanitary train. So the soldiers of Charleroi and other places lucky enough to reach a railroad station were piled into box cars, cattle cars, passenger cars or upon flat cars, helter-skelter, dead and dying together, and the trains moved as best they could towards Rheims, Châlons and other points. Sometimes it took them days where it should have taken them hours to reach a hospital, because of the congested condition of the line. Consequently it was not unusual for the soldiers to reach their hospitals dead, or so badly done-up by the time lost and the rough ride, that they died soon after they had left the train.

Gradually this condition was improved by the railroads. Sanitary first-aid stations were arranged in the depots so that the wounded could be cared for while waiting for the trains. The



A French Freight Car Transformed into a Hospital Car

* Our special European correspondent.

next step was to secure more rapid movement, and then to increase the number of trains, which by October last totaled 600 on all the roads.

The final step, which began by the swinging of hammocks, one above the other, in the cars, so the wounded could be comfortable without taking up too much of the precious space in the cars, was the so-called sanitary train. The sanitary train implies above all that it carries with it the means of saving human life while the train is moving on its way to the permanent hospital.

At first the sleeping and dining cars of the Pullman type used by the Paris Lyons & Mediterranean and other railroads were used as temporary moving hospitals for the treatment of men who would surely have died if the surgeon had had to wait until he was in a real hospital to treat them. One of these hospital cars was put on each train and those needing treatment were carried into it as it was on its way. The trouble with the Pullman cars was their weight. They rendered excellent service, but a car weighing 37 tons used too much of the tractive effort of an engine. The more cars a train for the wounded can carry just now means that more lives will be saved. Hence there was evolved the idea of converting the homely, often-despised, ill-treated box car into a little hospital. One of these cars and two other light cars could be hauled in place of one 37-ton car. Wherever the idea originated, credit must be given to Commandant E. Loiseleur, in charge of the fourth bureau of the war department, a bureau devoted to railway service, for actively carrying out the plan.

At present these light, clean, little hospitals are rolling from the front to every hospital district in France, to the number of 600; that is one to each train. War time is the hardest time of all for the advancement of an idea, no matter how good, and it was only after the greatest effort that Commandant Loiseleur was able to persuade anybody to begin re-building these cars. Among the first built was one made over with the money given by an American, Mrs. Washington Lopp. She gave the required $220, and now her car is saving lives every day.

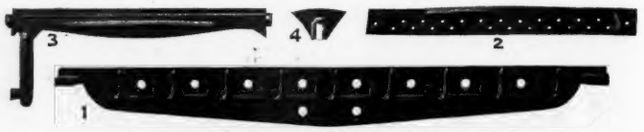
This 30-ft. car when rebuilt—the rebuilding consists of painting it, boarding its inside, and installing certain small-priced articles—is divided into three parts. First, there is the operating room proper, furnished with a canvas-topped table and various instruments and utensils needed in operations; second, there is a middle closet for the storing of medicines; and lastly, there is a kitchen for the boiling of water, for the making of broth, and the burning of the cloths and cottons used in treating the wounded. The entire interior of the car is painted with white enamel, the floor is covered with linoleum, and every measure is taken to preserve its aspect and usefulness as a hospital.

Recently Commandant Loiseleur showed me some reports he had received from different trains provided with these little hospitals, and to read a report was to be convinced of their usefulness. One report showed that of 350 men taken at one time to Brest, a long, slow ride from the front all the way across Brittany, there were no deaths. At different points along the route, no less than 33 men had been received into the hospital and injected with anti-tetanic serum, while 4 others had had fractured limbs set. Another report showed that of 418 wounded taken to Rouen, all badly wounded, 200 had been treated, and but one death was registered. Still another report showed that in a train with 611 wounded, the lives of 5 had been positively saved by operations, and 55 others had had their wounds dressed. There was a report from another part of the front, where the fighting was as bad as any yet seen, and of 163 men in a train, 22 underwent immediate surgical operations, had bits of shell taken from their bodies, and were otherwise cared for. So the reports ran on, some of them dealing with deliveries of wounded to the American hospital at Neuilly, a suburb of Paris.

South African Railway Men With the Colors.—The "white," i.e., not colored, staff of the Union of South Africa Railways number 31,000, and of these 3,922, or 12½ per cent. are serving with the colors.—*The Engineer, London.*

LOCOMOTIVE GRATE WITH LARGE AIR OPENINGS

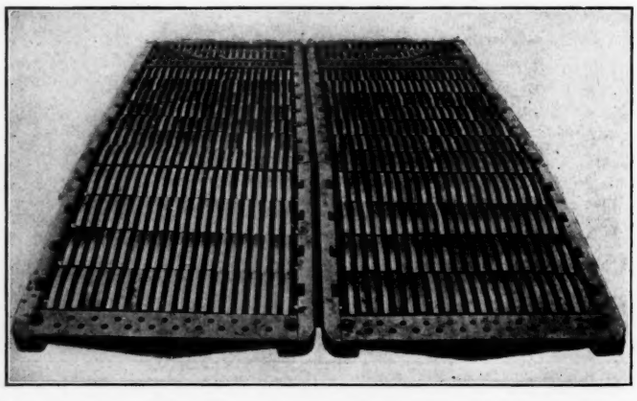
At the recent convention of the International Railway Fuel Association it was stated that from a canvass of 21 roads, it was found that the percentage of the area of the air openings in the grate to the total grate area varied from a minimum of 28.5 per cent. to a maximum of 49.6 per cent., and that the average was 37.2 per cent., with 1 in. openings between the fingers, for bituminous coal burning engines. It was also stated that the Seaboard



Parts of the Hulson Grate

Air Line strongly favored the table grate on account of its large air opening. The advantage of a large total air opening in the grates without an excessive width of opening between the fingers is generally acknowledged.

The illustrations show a grate for locomotives which provides an air opening area of 55 per cent. of the total grate area, with ⅝ in. openings between the fingers, and with possibilities of a larger percentage of air space where the conditions permit. This grate is made by the Hulson Grate Company, Keokuk, Iowa. It has been installed in a large number of stationary plants and has been made standard on the locomotives of one railway. The experiences of those who have it in service indicate that with the large amount of air opening in the grate it has been possible to more thoroughly consume the coal, thus producing less smoke and keeping cleaner fires. Many cases have also been found where a



The Hulson Locomotive Grate for a Firebox 108 in. by 66 in.

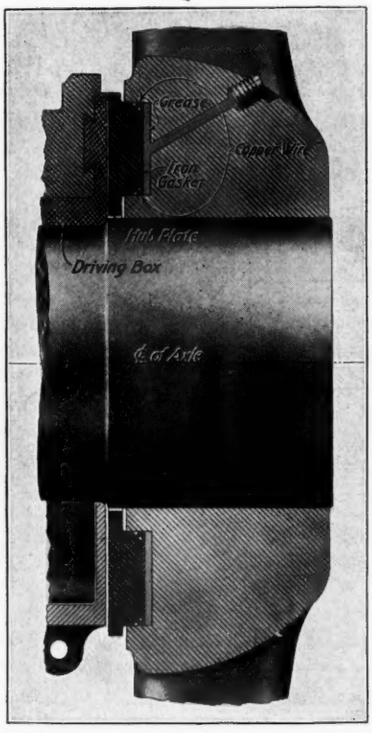
cheaper grade of fuel can be used with this grate. Because of the better consumption of the fuel several of the users report considerable savings in coal consumption.

Aside from the large amount of air space provided by this grate the mechanical features are of considerable interest, the purpose of the manufacturers being to provide a grate of as simple construction as possible, with a minimum amount of trouble to repair. The details of the grate are shown in one of the illustrations. No. 1 is the side bar; No. 2 the tie bar; No. 3 the finger bar, and No. 4 the finger. The fingers are all loose on the finger bar, which permits expansion or contraction without affecting the finger bar. The fingers slide on to the finger bar from the end, being held by means of a key cast into the bar and fitting into a keyway in the fingers. This construction has been adopted to make possible the renewing the fingers, should they become broken, at a very small cost, the finger bar simply being lifted from the side bar and the broken finger replaced. It will also be noted that the tops of the fingers are curved so that when the grate is rocked slightly, a rubbing action will be produced on

the fuel bed, which dislodges the fine ash without disturbing the fire or allowing the unburned fuel to drop into the ashpan. By shaking the grate for the full stroke, however, it is possible to dump the fire. The construction of these fingers also tends to raise the bed of the fire sufficiently high from the mechanism of the grate to keep it from being subjected to the severe heat. It is also claimed that the large percentage of air space in the grate permits the use of a larger exhaust nozzle, since as much draft will not be required to pull the air through the grate bars. With the ⅝ in. openings there will be a more even distribution of the air through the fuel bed, which permits of a lighter fire being carried.

ADJUSTABLE HUB PLATE

The Smith adjustable hub plate is maintained at the proper distance from the hub by means of compressed grease, the adjustment being made by screwing in the grease plug shown on the outside of the wheel hub. The adjustaable plate is forced into a recess in the hub, which is 1 in. deep and varies from 2 in. to 3¼ in. in width, according to the size of the wheel. It may be applied either by hammering or under a press, about 20 tons being required to press the plate into place. Patents have recently been granted on an improvement in this device designed to increase its effectiveness. The new feature is the method of preventing the grease from leaking past the plate and relieving the pressure, which would affect the adjustment. The plate is beveled to receive a No. 9 gage copper wire, which is placed around the outer and inner edges of the plate, as indicated in the illustration. This wire is soldered so as to be continuous. A No. 24 gage iron liner holds the copper wire in place as the hub plate is forced outward by the grease pressure. As the hub plate is forced into a bearing in the hub the copper wire assumes a rectangular section, thereby making a more perfect seal. The plate is kept from rotating by six ¾-in. dowel pins screwed into the plate and fitting into the holes in the wheel hub.



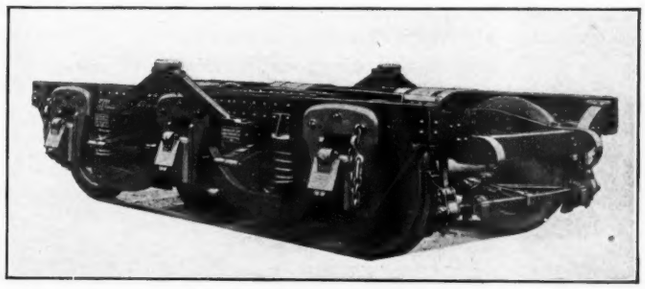
Smith Adjustable Hub Plate

By the use of this device the lateral may be maintained constant and it may be taken up with comparatively little labor, it being possible to adjust all the wheels in from one to three hours. This eliminates the necessity of dropping the wheels and relining the face of the driving boxes when the lateral becomes too great. By the use of this hub plate much less lining material is required on the face of the driving box, inasmuch as the hub plate is ½ in. thick on its outer flange. Excessive wear on the driving box liner is also eliminated as the lateral may be properly maintained and thus prevent pounding, due to the excessive lateral, which many times breaks away the driving box liner. It has also been found unnecessary to reline the boxes between shoppings. The plate can be applied to old as well as new locomotives. The right for its use is sold by the Smith Locomotive Adjustable Hub Plate Company, Pittsburgh, Kan.

ROLLED STEEL TRUCK FRAMES

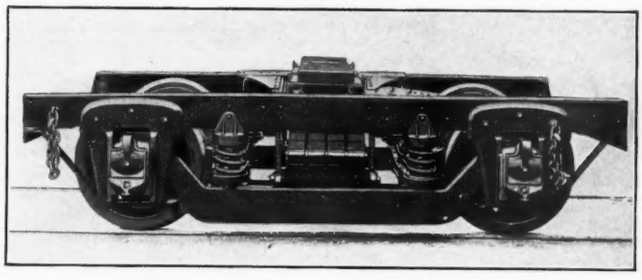
In designs of four-wheel and six-wheel passenger trucks developed by the American Car & Foundry Co., New York, the frames have been made up almost entirely of standard rolled sections. The idea in designing these trucks was to reduce both first cost and maintenance troubles. Repairs to the frames can be made at almost any shop and experience has shown that under ordinary service conditions, heavy repairs requiring special work and tools are unnecessary.

In both designs the attempt was made to secure maximum strength and service ability with a minimum weight. The frame for the four-wheel truck weighs approximately the same as the old wooden frame having iron flitch plates, while there is a marked advantage as regards strength and rigidity. All rivet holes are reamed to size and the more important rivets are machine driven. Large gusset plates are used to connect the cross members to the truck sides and the friction plates for the bolsters are located on the bolster hanger brackets, thus removing the lateral strain from the cross members. The brake hanger bracket is secured to a presssd arm, which is supported by the truck side and the cross member gussets. The bolster hanger is extra long and the pins are of large diameter in order to reduce wear. Either the usual design of inside hung brakes or the American Brake Company's design of clasp brakes may be used with this truck.



Six-Wheel Truck with Rolled Steel Frame

The six-wheel truck has been found to meet all the requirements of high-speed passenger service, trucks of this design having been used for some time under heavy passenger equipment cars, including dining cars. It is claimed that frames for the six-wheel truck are approximately 3,000 lb. lighter per car than the usual design of cast steel frame, this advantaage being obtained because in the rolled steel design the metal can be placed to better advantage at the points of greatest stress. The American Brake Company's clasp brake arrangement can be used with this truck, as well as with the four-wheel design.

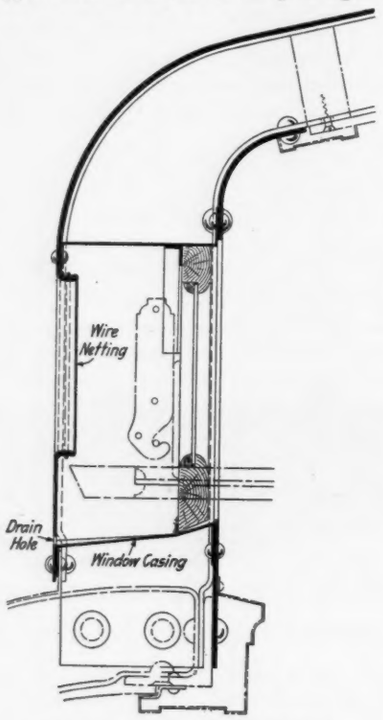


Rolled Steel Frame Four-Wheel Truck

THE CENTRAL RAILWAY STATION AT LEIPSIC, GERMANY.—The building of the new central station in Leipsic, which, when completed, will be the largest in Europe, is being steadily proceeded with in spite of the war. The second half, intended for the traffic of the State Railway lines of Saxony which touch the city, will, in accordance with the original plan, be finished during the present year.

PASSENGER CAR ROOF CONSTRUCTION

There has always been more or less difficulty in securing a satisfactory upper deck construction in passenger cars of the clere-story type. The dufficulty has been to secure a deck which could be cheaply built and in which a satisfactory casing could be provided around the deck sash and screens. The accompanying drawings show a type of construction recently patented by Otto B. Johnson, New Glasgow, Nova Scotia, which is designed to overcome these difficulties and to simplify the securing of weather-proof connections between the lower roof and the deck of the car.

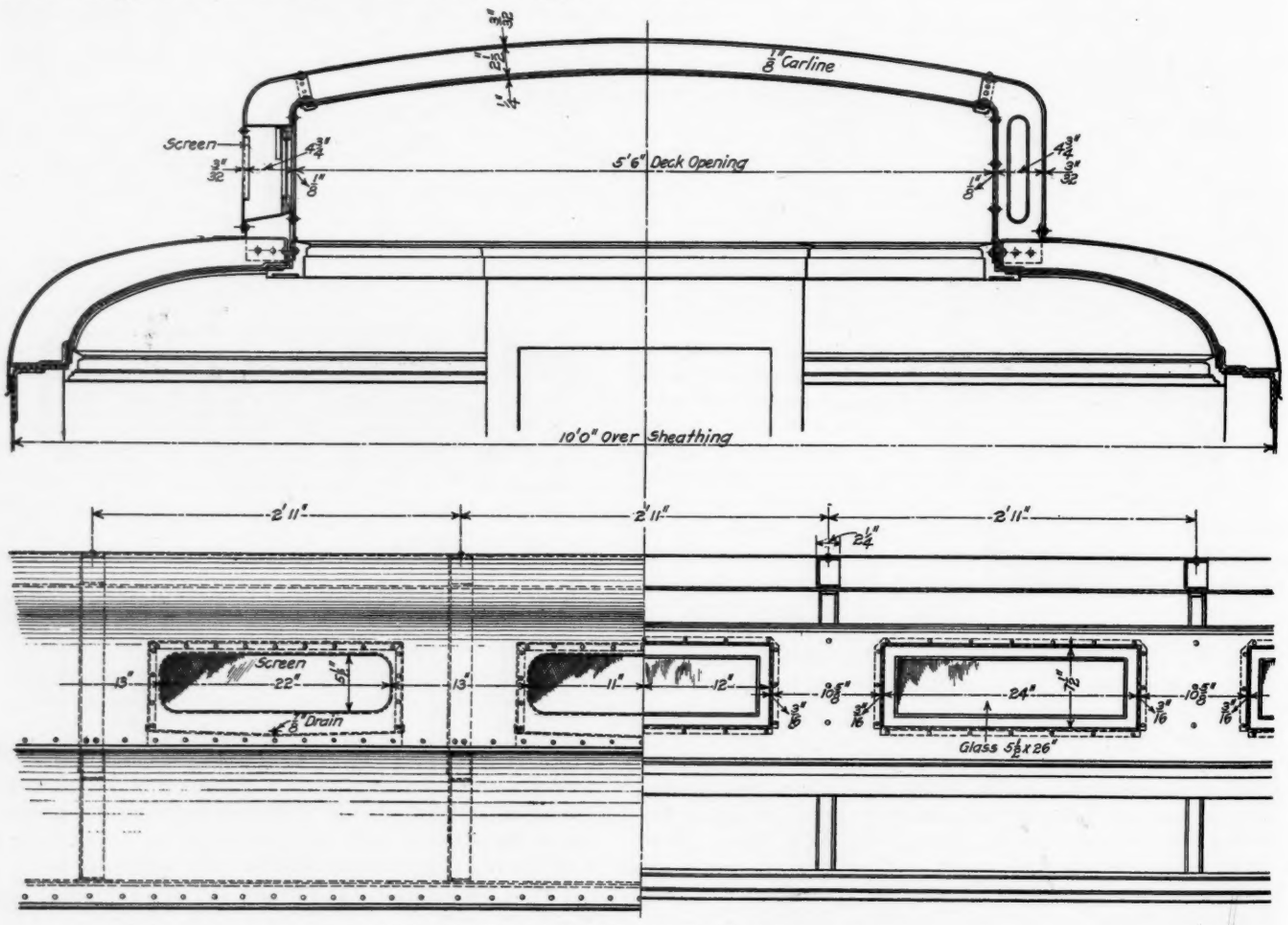


Detail of the Deck Sash Casing

In this construction the roof frame consists of special pressed steel channel sections, forming the carlines and upper deck posts, to the outside of which the fastened the roof sheets and to the inside of which the interior finish is applied. The sides and roof of the upper deck are covered with continuous sheets formed to the contour of the roof. Flanged openings are provided in these sheets for the ventilator screens which are secured against the edge of the flange by means of a wire clamp. The deck posts are secured at the bottom to the upper ends of the lower carlines and to the deck sill angle, the three pieces being securely riveted together. The upper ends are bent to form a connection with the upper carline, with this construction the soldering of flashing around the posts is avoided, which is unsatisfactory and expensive, and continuous roof sheets from lower deck to lower deck may be used. The lower roof sheets may be formed with vertical flanges at the sides of the deck and directly riveted to the upper roof sheets.

Instead of having a continuous flashing and sash frame throughout the length of the deck a combined flashing and frame is provided for each opening which completely encloses the space between the screen and the sash. The remainder of the space between the sheathing and the interior finish of the car is thus enclosed from communication with the outside air and serves as insulation. The bottom of the window casing slopes outward and toward the middle and drains through a small hole in the outside sheet.

This construction is claimed to make possible a considerable saving in weight as compared with the usual type of clere-story roof.



Simple Weather Proof Passenger Car Roof Construction

Maintenance of Way Section

The War and Track Labor

In spite of the reduced amount of work under way the labor situation has become quite acute on some roads during the last three or four weeks. Late last year considerable numbers of Austrians returned to their country. With the entrance of Italy into the European war, many members of this nationality, including large numbers of track laborers, have been called home and are leaving this country. The placing of large orders for ammunition and other supplies for the belligerent countries in the United Sttaes has also required the employment of additional labor in these factories, drawing still more men from the track forces of the railroads in the vicinity of these industrial centers. While this condition has not seriously affected the maintenance of way forces of the country at large, the forces of several eastern roads have been reduced considerably below the authorized quota.

Every-Day Railroad Construction

The magnitude of routine railway construction activities is frequently overlooked by railway men themselves and is seldom realized by the general public. Several months ago we called attention to the fact that the Chicago, Milwaukee & St. Paul moved over 48,300,000 yd. of earth in 1912 and 1913, or an average of over 66,000 yd. per day for the entire period. During the same interval this road placed over 563,800 cu. yd. of concrete, building 741 structures. Another railroad of less than 1,000 miles has placed over 1,521,000 cu. yd. of concrete during the 10 years from 1905 to 1914, inclusive. This is at the rate of 12,680 cu. yd. per month, or 490 cu. yd. per working day for the entire 10-year period. The minimum amount of concrete placed by this road in any single year during this period was 91,700 cu. yd., while the maximum was 236,125 cu. yd. Operations such as these are equalled in other fields only on special projects such as the construction of the Panama Canal and are one measure of the importance of our railway activities.

Maintaining Bridges in Cities

It seems to be a general rule that railroad bridges in large cities are poorly maintained. This applies particularly to structural steel viaducts in densely populated or commercial districts. Excluding the special case of deterioration due to corrosive gases, the principal source of trouble with the city bridge is the accumulation of dirt, which seems to be present everywhere in the portions of large cities commonly occupied by railroads. This material is deposited on all horizontal surfaces of bridges below the floor level, on the bottom flanges of stringers and floor beams and around the bearings, frequently piling high on the bridge seats. The filthy character of the deposit makes the inspection, cleaning or repairing an exceedingly distasteful job, and probably accounts for procrastination with respect to this work. The use of modern tight pavements, with adequate drainage systems and efficient street cleaning, has had a tendency to improve conditions, but proper attention to this phase of the subject in the design and detailing of the bridges will still further relieve the maintenance forces. Dust guards completely covering the bearings and rollers should be provided and the arrangement of bridge seats and bearings should be such that all parts are readily accessible to inspection and cleaning. The bottom of the vertical web members of trusses should be filled with concrete to eliminate pockets for the accumulation of dirt deposits. The maintenance department, by giving proper attention to the new bridge will avoid much work at a later date. The small details should receive special consideration. Drain pipes must be kept open, cracks or slots through which dirt and dust may be sifted should be closed, and any other preventive measures which have been overlooked by the construction department should be taken immediately. The conditions surrounding the railroad bridge in the city are such that the maintenance expense is bound to be higher than that of the bridge in rural districts, and if the city bridge does not receive attention in the proportion established by these conditions, its life will surely be shortened.

The Tendency Toward Longer Rails

An interesting feature of this year's rail orders is the tendency to buy longer rails. At least two or three roads have ordered considerable quantities of 39 ft. rails, while one road has ordered 40 ft. rails. Other roads are seriously considering this question, and one line at least was prevented from ordering 39 ft. rails only by the fact that it did not have sufficient equipment of the proper kind long enough to carry them. A number of years ago several roads laid considerable quantities of rails up to 60 ft. in length. In some instances these proved satisfactory, but with the poor roadbed conditions and lighter ballast of that time the 60 ft. rails were difficult to maintain, and most of them have since been sawed into shorter lengths. With the improved roadbed conditions and the more liberal use of ballast in recent years, some engineers feel that the roads are now warranted in laying longer rails. In this connection it is interesting to note the conditions on foreign railways. In England the standard length is now 45 ft. One or two railways use rails 48 ft. long, while the London & Northwestern uses 60 ft. rails. French and Egyptian railways lay rails 39 ft. 4 in. long, while 59 ft. rails are coming into common use. The Northern Railway of France is now laying rails 78 ft. 9 in. long. In India and Australia, 36 ft. and 40 ft. rails are being laid in considerable quantities. Thus we have numerous precedents for adopting longer rails in this country.

Starting Maintenance Work Early

The economy of starting maintenance of way work early in the season has been emphasized repeatedly in these columns. Since the main reason for delaying the inauguration of active work until the middle of the summer is to hold down expenses during the latter part of the fiscal year, it is somewhat surprising at first thought to observe the increasing extent to which work was inaugurated early in the spring this year in view of the declining railway revenues. However, this is a most encouraging feature of railway operation, indicating a realization on the part of executives of the economy of this practice and a willingness to forego temporarily a "paper showing" to secure real economies. It requires courage to do as did one road, now in financial difficulties and threatened with a receivership, in starting its track work early this spring after having delayed such work until after July 1 last year. The expenditures for maintenance of way for the fiscal year just closed will, therefore, be unusually high, the savings being reflected in the reports of the following year. If a road in this condition can adopt these measures there would seem to be little reason for the stronger lines hesitating. The greatest economy in maintenance

of way will only be secured when the work of this department is conducted without reference to the fiscal year and each problem is handled at the most favorable season.

Co-operation in Equipment Development

Complete co-operation between the manufacturer and the user of any material is necessary to its highest development. Few devices are perfect the first time they appear; practically all have to pass through a period of initial experiment and development. The railroads of this country have aided greatly in the development of the materials and equipment used by them by offering their facilities, by encouraging tests to be made under actual service conditions and by giving the manufacturers the benefit of their observations of such tests as a means to overcoming weaknesses. By combining the practical experience of the railway man as a user with the ability of the manufacturer to concentrate on production, the latter has been enabled to produce a practicable commercial article. Although working for his own individual gain, a maker of railway supplies is able to succeed only as he makes a product which the railways can use with economy to themselves. Because of this mutual co-operation the railways of this country lead those of the world in much of their equipment and construction.

The Development of Manganese Track Construction

One of the relatively recent developments in construction has been the use of manganese for frogs, crossings, switch points and other parts of track which are subject to unusually severe wear. The importance of this form of construction is indicated by the statement in the article by V. Angerer, in another column, that 21,300 such units were manufactured in 1913. Within the past two years the manufacturers of manganese track work have determined among themselves on certain minimum standards of construction below which they will not go, and they have submitted these standards to the American Railway Engineering Association for approval. This action has been taken because of conditions which have arisen in this field jeopardizing the future of the manganese industry, as outlined in the article referred to. The special problems of manufacture, particularly with materials such as manganese which require unusual and careful treatment, are essentially those for the manufacturers to solve. The ability of such construction to stand up under the heavy pounding of traffic on busy lines is of direct interest to the maintenance of way engineer. Properly made and placed manganese track construction has demonstratd its economy, and co-operation in establishing standards which will insure an improved product, will result to the benefit of the railways and the manufacturers.

TOOLS FOR MAINTENANCE OF WAY EMPLOYEES

ON another page of this issue is an interesting discussion of the subject of tools for maintenance of way forces which includes a number of suggested lists of tools for gangs engaged in the various classes of maintenance work. Of particular interest is the agreement of the several writers concerning certain phases of the subject which indicates a similarity of experience. Each one emphasizes the importance of a sufficient supply of high grade tools, their proper maintenance by a skilled tool man, and the influence of the character of the tools on the efficiency of the men. Attention is also called to the benefit to be derived from the acquisition of the latest developments in tool manufacture.

It is well to consider the magnitude of the investment represented by tools for maintenance of way work. A decision to add one tool to the complement of each track gang on a road of any size may cause an expenditure of several hundred dollars. The Nebraska State Railway Commission, in making a valuation of the roads of that state in 1912, put the allowance for tools for a section gang at $120, and for each extra gang and bridge gang at $600. Without question the money value of some of the lists of tools referred to above would far exceed the above estimate.

Of no less importance is the maintenance of tools, a phase of the subject influenced very largely by the quality of the tools acquired and the measures taken for their proper care in use. The purchase of tools at the lowest price to the subordination of quality is sure to result in larger repair bills, shorter life, and an increase in the number of accidents due to defective tools. On the other hand, having provided good tools, their proper maintenance is paramount and a definite plan for repairs, sharpening and inspection is necessary if the advantages of the higher grade equipment are to be realized.

Having determined the number and quality of the tools to be supplied to a given force, it is necessary to select the particular type of tools most suitable for the class of work, local conditions, etc. The difference of opinion as to the proper tamping tools to be used for the same class of ballast, as expressed in the discussion, indicates one of the difficulties to be met. The serious consideration of the many new devices which are introduced from time to time is also important.

THE USE OF LIQUOR IN MAINTENANCE CAMPS

RULE G of the Standard Code of the American Railway Association, which prohibits the use of intoxicants by employees while on duty and makes their use or the frequenting of places where they are sold, a sufficient cause for dismissal, is very generally incorporated in the standard books of rules of the operating departments of the different roads. The application of similar rules to the maintenance of way department is far less general, largely because of the different conditions governing the work, the varying degree of responsibility and the different classes of labor employed.

Few roads will permit open drinking among their track foremen. Beyond this, little attempt is usually made to curb the use of intoxicants. On some roads no liquor is sold in the camp commissaries, nor is it allowed to be brought into the camps. In others the commissaries are not permitted to sell it, but the men bring it in from the outside if they desire, while on other roads the commissaries sell it openly to the men. One road on which the latter plan was in force a recent investigation led to the conclusion that a large per cent of the drinking was the result of the men being exploited by the commissaries. Practically all of the men employed in the camps on this road are foreign, approximately 60 per cent of them being Italians and the remainder Austrians and Montenegrins. Starting six months ago, this road forbade the sale of intoxicants through the commissaries and also prohibited the bringing of liquor into its camps. While some is undoubtedly still brought in secretly, the open sale of it has entirely disappeared. When this rule was put into effect it was feared that considerable numbers of men would leave for adjoining roads where such regulations were not enforced. But only a few left, and there was no organized complaint.

The results of this campaign have been shown in the increased efficiency of the men, in the reduction in the amount of sickness and particularly in the greatly lessened amount of laying off. While there has been no opportunity to test the effects of this action in the ability to secure and hold men in times of labor shortage, the officers feel well pleased with the results secured thus far.

NEW BOOKS

Manual del Ingeniero por John C. Trautwine, Traducido de la 19th Edicion por A. Smith. Published by Casa Editorial Gardnier Hermanos, Paris, France. Price $5. On sale in America at Van Nostrand & Co., New York, and Brentano & Co., New York.

This is a translation of the 1913 edition of Trautwine into Spanish. The chief interest to American and English railroad men in the fact that this translation has been made is that the translation is a literal one. It therefore affords an opportunity for the

American engineer who is desirous of learning Spanish technical engineering terms of using this Spanish translation in connection with the English edition of Trautwine. In South America English speaking and Spanish engineers are working side by side and a Spanish translation of the American standard engineering manual is an event of importance to both the American engineer in South America and the Spanish engineer who may be working with him. The very fact that Trautwine covers such a broad field in such great detail makes the Spanish translation of particular value to the engineer who wishes to learn the Spanish language.

Manual of Surveying for Field and Office. By Raymond E. Davis. Size 4 in. by 7 in..; 395 pages. Bound in flexible leather. Published by The McGraw-Hill Book Company, 239 West Thirty-ninth street, New York. Price, $2.50.

The author states in his preface that the book is designed for the use of civil engineering students in their preparation for field and office exercises. To the man engaged in actual railroad surveying its value would be as a supplement to the usual railroad manual, particularly as a reference to triangulation and precise measurements and for astronomical observations. There are eight chapters, arranged in the order of progress of the surveying student. The first chapter deals with field notes, note-books, accuracy and other matters of general information to the novice.

The remarks on accuracy and the method of keeping notes are well worth the reading. However, the failure to mention the loose-leaf note-book is surprising. The pages on the care and adjustment of instruments are, of course, absolutely essential to the novice, but even the experienced engineer will find them useful at times. The later chapters consist principally of typical exercises in the use of the various instruments. There are 123 pages of tables. Of these 19 cover logarithms and trigonometric functions and 19 are for use in astronomical observations.

Practical Track Work. By Kenneth L. Van Auken. Size 5½ in. by 8 in., 216 pages, 48 illustrations. Bound in cloth. Published by the Railway Educational Press, Chicago. Price $1.50.

As its name indicates, this book is intended for the practical track man. The author made no attempt to prepare a complete treatise on maintenance of way work or to discuss features of engineering design, but has covered only the problems that are of direct interest to the track supervisor and foreman. He has taken their viewpoint throughout in his discussions, and while higher officers will not agree with him on all points, he reflects the attitude of the track men gained by extended experience as a laborer and a foreman.

The contents of the book are best indicated by noting the chapter headings. (1) Labor and Organization; (2) Track Materials and Tools; (3) Spiking, Bolting, Cutting and Curving Rails, etc.; (4) Constructing Track on a New Line; (5) Double Tracking; (6) Relaying Track; (7) Construction of Turnouts, Ladder Tracks and Crossovers; (8) Slip Switches; (9) Surfacing New Track; (10) Laying Out a Curve with a Tape Line.

Considerable space has been devoted by the author to the proper care of the laborers, especially those who are in floating gangs, and to the organization of forces for various kinds of work. The methods of putting in switches and taking care of other complicated track work are described in some detail, with sketches and organization charts.

While not covering all problems with which a track man is confronted, this book contains much information which will be of value to the average track foreman and is well worth reading by higher officers having to do with track work. It forms an important addition to the limited literature on this subject. An interesting feature is a glossary of 500 track terms in common use. The book also contains 20 tables giving practical data of use to the foreman.

Letters to the Editor

CLASSIFYING SCRAP RAIL

SAVANNAH, Ga.

To the Editor of the Railway Age Gazette:

I have read with much interest the article by L. C. Fontaine in the *Railway Age Gazette* of July 16, in regard to the classifying of scrap rail. The amounts in dollars and cents transferred in accounting for rail by reason of adjustments, as has been stated, is quite large and is entirely due to differences in opinion in classifying. To take care of rail classifications properly and to avoid these adjustments, a written classification should govern the differentiation between relay and scrap rails as removed from tracks. In addition the classification should be indicated on the rail ends with paint, different colors being used for each class. The classification should be made only by roadmasters, supervisors or others thoroughly familiar with such work, because it has been found that classifications made by the average section foreman have a tendency to vary in a great many cases from those which should properly have been assigned, by reason of the condition of the rail. By use of the paint method rail may be transferred from one division to another, without fear of the classification being changed. If originally made in accordance with specifications the expense of painting will be a small factor because of the benefits derived from an accounting standpoint.

H. E. DUGGER.
Chief Clerk to General Storekeeper Central of Georgia.

THE INCLINATION OF THE RAIL IN ECONOMIC RAILROAD PRACTICE

NEW YORK, N. Y.

To the Editor of the Railway Age Gazette:

The main object of wheel coning is the elimination, as far as possible, of the rubbing of wheel flanges against the rail as when a wheel-flange approaches the rail, the tread of this wheel is running on a greater diameter than that of the opposite wheel on the same axle. Thus the wheel-flange swerves away from the rail until the corresponding action takes place on the opposite wheel. The action of a pair of wheels passing around a curve is not referred to here. The standard coning or taper on the tread of railroad wheels throughout Europe as determined by long experience is 1 in 20, with the exception of Italy, where the Government Railways have adopted a coning on the wheels of 1 in 10. The only recognized standard for the contour of wheels in the United States is that of the Master Car Builders Association, which is 1 in 20.

The running of coned wheels on upright rails is not justified from any standpoint. A standard wheel coning having been generally adopted, the only scientific thing to do is to incline the rail normal to this coning. This practice is standard throughout Europe, with the result that rail wear there is considered generally satisfactory. Rail wear in the United States is considered as being generally very unsatisfactory; one reason for this being the general use of the upright instead of the inclined rail. Only the inertia of bad habit can be urged for the continuance of the unscientific practice of using an upright rail.

The inclination of the rail presents the following advantages: From the standpoint of the equipment it keeps the tread wear away from the flange, thereby obviously reducing flange wear; it reduces the bending stresses in car axles, so helping to eliminate hot journal box trouble, and it prolongs the life of wheels. From the standpoint of the rail it effects a reduction of the flange rubbing; it produces rail wear, under normal conditions, in the center of the head of the rail instead of on its edge. In the latter position of the load, not only is rail wear excessive, but stresses are induced calculated to accentuate the danger of broken rail from the formation of transverse fissures. It places the load on the rail in the position where the rail can exercise its function as a beam

with minimum fibre stresses. It equalizes the pressure on the base of the rail, through the base being normal to the resultant force from weight and the wedging thrust due to the coning of the wheels.

It eliminates the tendency of the rail to overturn (in railroad parlance, *to roll out*) from the wedging action of the coning. And it prolongs the life of the rail.

The subject of rail wear is increasingly occupying the attention of engineering societies and technical papers, because of the expense of rail renewal standing out so prominently in railroad operating reports. Strangely enough, although uniformly standardized in Europe, the simple expedient of inclining the rail normal to the wheel coning has not received the attention it deserves in the United States. It might as well be frankly admitted that the lack of consideration of rail inclination is due, first, to the inertia of habit; second, to timidity in putting in practice one's scientific deductions on a subject until the idea involved in that subject becomes more or less general; third, and perhaps most insidious of all, to the idea that the section of rail is responsible for much trouble, which could have been avoided by inclining the rail instead of placing it upright.

Among the fallacious suggestions made on behalf of saving the rail may be mentioned the following:

1. Reduction of the existing standard coning. This suggestion, if carried out, would be productive of dangerous side thrashing of equipment and could not be considered as a move in the direction of safety. When wheels have been worn to an average taper of 1 to 40 they are ready for attention at the shops. Reducing the coning would be an attempt to save the rail in an unscientific way at the expense of the wheels. The suggestion has been answered by the wheel committee of the M. C. B. Association at its meeting in June, 1915, as follows:

"A communication has been received from one of the roads, a member of this Association, criticising the present standard taper of tread of 1 in 20, and recommending that a change be made to 1 in 38, the claim being made that the present standard taper is responsible for increased rail renewal, and is also more severe on the wheel itself. It is the opinion of your committee as a whole that any reduction in the taper of the tread will be detrimental to the wheel, but that if it can be shown that such change would be of sufficient benefit to the rail as to more than offset any bad effect on the wheel, they would be willing to consider such change."

2. Compromising on a rail inclination of half the requisite amount, viz., 1 in 38 or 40. There is no scientific argument in favor of such a compromise. The inclination of 1 in 20 on rail would tend to return to standard the profile of old rail, and would tend to return to standard the profile of wheels worn on upright rail. All that could be said for giving rail an inclination of 1 in 40 is that it would tend to keep wheels, worn to an average taper of 1 in 40 (and thus unquestionably ready for sending to the shops), from becoming still flatter. With standard wheels running on rails inclined only to 1 in 40, there would still be a wedging thrust of one-fortieth, or 50 lb. per ton, of the wheel load, tending to overturn the rail.

The apparent abnormal effect of an inclination of 1 in 20 on old rail or on worn wheels would really be advantageous to such rail and equipment. The rail would receive the wheel load outside of the center of the head, but not more so than the load rests inside of the center with the average conditions of operation on an upright rail. This position of rail wear would gradually approach the center of the head. On old rail under such conditions the wear would be in the most economic position, in that the rail would be worn where it had not been worn before. Another point of advantage in inclining old rail and having the position of rail-wear outside the center of the head, is that during the process of the wearing position approaching the center of the head, the bending stresses in car axles would be reduced below normal for the reason that the lever arm between the center of the journal bearing and the point of bearing of the load on the wheel would be reduced considerably.

John Lundie.
Consulting Engineer.

SPECIAL TRACK CONSTRUCTION AT WATER CRANES

Prowers, Colo.

To the Editor of the Railway Age Gazette:

One is frequently asked for a means of preventing the burning out of ties at water cranes, and I have seen a special form of track construction used very successfully to overcome this trouble and believe that the following description will therefore be of interest.

The ground was excavated under the tracks to a depth of 32 in. below the base of rail. Forms were then built for a continuous concrete wall under each rail, 18 in. wide at the bottom and battered to 8 in. at the time. A fastening for the track rail was secured by imbedding an old rail in the wall, head down. Holes were drilled in this inverted rail every 21 in. on both sides of the base. Bolts were inserted with the heads on the under side so that when the concrete was placed the threaded ends of these bolts projected above the top of the walls. The track rails were then drilled to correspond and were bolted securely in place.

This form of construction was used for 75 ft. each way from the crane. For the safety of the employees the space between the walls was filled with earth to the level of the base of rail. The track has been kept in perfect line, surface and gage.

Ralph E. Pitts,
Section Foreman Atchison, Topeka & Santa Fe.

[The form of track construction described above undoubtedly is successful at points where all trains are operated at relatively slow speed. There would be considerable question, however, as to its durability and safety for heavy, fast traffic. It is also desirable to call attention to the fact that the method of building as described is practicable only where the tracks can be put out of service a sufficient time to permit the concrete of the walls to set properly, the trains being detoured, presumably, over adjacent passing or side tracks.—Editor.]

THE DISTRIBUTION OF LABOR ACCOUNTS

Haileyville, Okla.

To the Editor of the Railway Age Gazette:

As the maintenance of way department is the subject of much discussion so far as operating expenses are concerned, and since when a reduction of expenses is to be made, this department is the first to be attacked, the accurate distribution of the labor accounts to show the proper charges for all work performed is essential. There is an important factor that is sometimes not considered when arriving at a decision concerning the reduction of forces. It is simply this, the section foreman in many cases is not a good bookkeeper and in making his monthly distribution for labor he is liable to charge it all to track work when, as a matter of fact, a considerable percentage may have been spent in assisting car men repairing cars, transferring freight and many other jobs of like nature. The aggregate of such work by the section forces on a hundred-mile division during a year amounts to no little amount, and were it carefully separated from the regular maintenance of track work it would show up to an extent which would, no doubt, cause the superintendent to give the subject due credit. It is so easy to call on the section men to assist at some job around the station, at the roundhouse, car shops, etc., that it is almost second nature to put out the call.

There is a wide field for the roadmasters to impress upon their foremen the importance of charging up every nickel to the account to which it justly belongs, and by so doing they will materially decrease the maintenance of track per mile each month of the year. There is no doubt that the section foreman is imposed on many times by having to do odd jobs outside of his regular and assigned work, and many times he suffers for it by reason of his not having had the time away from these hurry up calls to attend to his track work. A good way to make a check of the foreman's distribution is to require any office to send the instructions to the roadmaster's office every time a foreman is instructed to do any work outside of his regular duties. Then when the foremen's distribution sheets come in the roadmaster or his clerk can check these instructions with the distribution, and if such labor does not appear the foreman's attention can be called to it for a correction.

J. L. Coss,
Despatcher C. R. I. & P.

The Tool Equipment for Maintenance of Way Forces

Suggested Lists of Tools for Section and Floating Track Gangs, and for Bridge and Water Service Gangs

One of the most important essentials to the economical performance of work is the supplying of sufficient tools adapted for the work in hand. The following articles discuss tools for the different classes of maintenance of way work, giving suggested lists of equipment for gangs of varying sizes for the different classes of work.

TOOLS FOR TRACK GANGS

By "Supervisor"

In no part of railroad enterprise has there been so little progress in the last few decades as in the development of tools for track work. Our men today use the same devices, slightly modified perhaps, that were in use in the seventies. The gasoline motor car has apparently come to stay, and the writer has heard favorable comment on the use of compressed air tools for some forms of track work, but the latter are still distinctly in the experimental stage. Otherwise there is little change. In the main, the tool problem is still that of the proper use and distribution of the same old articles rather than the substitution of more modern and efficient devices.

The equipment of a given roadway force with sufficient tools for the quickest and most economical performance of its duties is very largely to be governed by local working conditions and the density of traffic. Certain general requirements are common to maintenance work the country over, and in addition each locality has its own requirements for which special equipment is essential.

The gravest mistake that can be made in this matter is to under-supply the men with tools. The money saved in tool bills can be lost so quickly in labor charges that great care must be exercised to see that effort is not wasted for want of equipment. The over-supply of tools is an error which must also be watched, in order that there may be no undue expense under this heading. In the following lists the writer has endeavored to give a fair equipment for section and general purpose gangs under ordinary conditions.

As absolute requirements may be classed tools for the maintenance of line and surface, for the renewal of worn switches, frogs and rail, for the replacement of ties and switch timbers, and for the proper protection of traffic while such work is being done. The size of the section gangs and the amount of work performed by floating or extra gangs on the various sections will have great bearing upon the number and kind of tools to be furnished, but for gangs of 4 to 15 men the following should embrace all the tools necessary to keep the track in condition:

adzes	1	per 4 men
axe, chopping	1	
bars, claw	1	per 3 men
bars, lining	1	per man
brooms, corn	1	
brooms, rattan	1	per man where there is snowfall
bags, tool	1	for each track walker
barrows	1	per 4 men
bits, ratchet	2	of each diameter in use
cars, hand	1	or more as required except in dense traffic yds.
cars, push	1	or more as required
chisels, rail	6	
cans, engineers' oil	1	
cans, oil	2	for each lampman
cans, water	1	
cups, water	2	(individual sanitary cups to be preferred)
frames, ratchet	1	
flags, red	6	(Painted iron portable signals are to be preferred to flags stuck in the ground on sections where the force is light)
flags, green	6	
flags, white	2	
forks, ballast	1	per man (where stone or slag ballast is used)
gages, track	1	
hammers, spiking	2	for 3 men, 1 extra
hammers, sledge	1	
hammers, hand	1	
handles, adze	1	extra
handles, axe	1	extra
handles, jack	1	extra
handles, pick	1	extra for each 6 picks
handles, spike hammer	1	extra for each 4 hammers
jacks, track	2	(If density of traffic requires raising bars, 1 jack may be dispensed with and 1 raising bar supplied for each 2 men)
levels, track	1	
lines, ditching	1	
lines, tape	1	
lanterns, red	6	
lanterns, green	6	
lanterns, white	4	
picks, clay	2	
picks, tamping	1	per man
ratchets	1	
spike pullers	1	
squirt cans	1	
saws, hand	1	
saws, crosscut	1	
shovels, track	1	per man and 10 per cent over
shovels, scoop	1	per man in ash ballast
torches	1	per man
rail tongs	1	per 2 men
tongs, tie	1	per 3 men
wrenches, monkey	2	
wrenches, track	1	per man

In addition, where the right of way is mowed by the section men, the following mowing tools should be provided.

grindstones	1	
scythes, brush	1	
scythes, grass	1	per man
scythe snaths	1	per man
scythe stones	1	per 2 men

In automatic signal territory, there should be provided a bonding machine, drills, punches, pins and bondwires. Other local conditions will make it necessary to have pike poles for ice and debris in freshets, devices for using combustible compounds at interlockers, fence repair tools, telegraph wire, wire cutters and climbers, and other articles too numerous to mention. Every section should also be provided with a first-aid kit, and the foreman should have at least a superficial knowledge of its use.

For the general purpose floating gang enough tools should be provided to permit it to handle any class of work coming up on the territory. For a gang of 26 men, exclusive of the foremen, the following should prove an ample supply for general conditions:

adzes	6	
axes, chopping	2	
bars, claw	12	
bars, lining	26	
brooms, rattan	26	
barrows	6	
chisels, rail	24	
chisels, cold	4	
cans, water	2	
cups, water	4	(individual sanitary cups to be preferred)
flags, red	4	
flags, green	4	
flags, white	2	
forks, ballast	26	
gages	2	
hammers, hand	2	
hammers, sledge	2	
hammers, spiking	16	
handles, axe	1	extra
handles, adze	2	extra
handles, pick	6	extra
handles, hammer	12	extra
handles, jack	1	extra
hatchets	2	
jacks, track	4	
levels, track	1	
lines, tape	1	
lines, ditching	1	
lanterns, red	4	
lanterns, green	4	
lanterns, white	2	
machines, bonding	4	
picks, clay	25	
picks, tamping	25	
pails, spike	4	
punches	4	
rail benders	1	
rail dogs	2	
saws, hand	1	
saws, crosscut	1	
shovels, track	25	
shovels, scoop	25	
shovels, long handle	12	
torches	25	
tongs, rail	8	
tongs, tie	10	
wrenches, monkey	2	
wrenches, track	25	

At the sub-division headquarters should be kept a supply of tools for which there is occasional use at various points on the territory but which it would be unwise to supply for the individual sections. These can be shipped out when needed and one tool will thus supply the needs of a large area. Among

the articles of this character may be mentioned rail benders, rail saws, high candle-power flares, portable electric lights for wrecking in the vicinity of explosives or inflammables, boring drills, stone drills and hammers, electric exploders, concrete mixers, pumps, ladders, ropes for rock cuts, rail unloaders, crabs, clamshell buckets and whatever other tools of this nature the work at hand may need. A toolman should be employed to keep this material in working order, to issue new tools and to take care of the repairs of old ones, and to keep separate the old tools sent in by each foreman until the supervisor or other officer can inspect them personally. This will prevent foremen from discarding tools before they are worn out, or from abusing tools as is so often done.

The lists given above will probably be criticised severely by maintenance men both for errors of omission and commission. Some tools which are in general use have been omitted, such as sight board and raising blocks. These are, however, but poor substitutes for grade stakes set at sufficiently close intervals, and it is the experience of the writer that a regular grade will soon be badly broken if track raising is done at haphazard, relying on the foreman's eye rather than on the wye-level. The same objection holds against the string lining of curves. Tamping bars are omitted because the writer has been able to get better and more uniform results from the tamping pick and the shovel in ash, slag and stone ballasts.

It will also be claimed that certain items are overstocked. Two jacks are supplied for sections and but four for large gangs. The second jack on the section is of great use when patching, working through turnouts and crossovers, and insures better work on curves. With a gang of 26 men, under a good foreman, every man can be kept hard at work tamping up, although but two jacks per rail are doing the raising. More and better work will have been accomplished at the day's end with four jacks and grade stakes than by using more jacks and trusting to the eye of the foreman to hit the grade.

The allowance of wrenches, spiking hammers and shovels is kept high on account of winter, emergency, and rush work. It is true that often there will be idle tools, but occasions will arise when every tool will be employed most profitably. Another item which must be considered is that proper tools and enough of them are the strongest safeguards against personal injury to the men. Handling rail, ties or switch material without proper tools is bound to result in nervousness, demoralization and accident. In providing and in using tools, as in every other phase of work on the railroads, the keynote of true success is "Safety First."

TOOLS FOR SECTION AND EXTRA TRACK GANGS

By P. J. McAndrews

Roadmaster, Chicago & North Western; Belle Plaine, Ia.

To secure full efficiency from expenditures for track labor, good tools of proper type must be used. The first cost of supplying such tools is not so important a consideration as the items of adaptability and length of service to be obtained. Unfortunately, first cost has too often been considered to the detriment of the service and at an actual net loss to the railway. Good tools being furnished, the next important step is to care for them properly, having repairs made at the right time and in a workmanlike manner.

For sections outside of terminals, where the length averages from 3 to 6 miles, a gasolene motor car is a necessity. Such a car should have a carrying capacity for the maximum number of men employed in ordinary maintenance, in addition to all the tools required for the work. The car should be simple in construction, with sufficient power to carry the gang at a speed not in excess of 15 to 18 miles per hour. A light but strong push car should be furnished each section so that the handling of ties and other heavy material need never be done on the gasolene car, nor on an ordinary hand car where gasolene cars are not provided.

For a section crew of about 10 men, the following tools are recommended:

One dozen shovels (short handled) with square points where gravel, cinder or earth ballast is used and with round points where stone ballast is used.
Four track wrenches, with an additional number where more than one size of nuts is in use on track bolts.
One track gage.
One track level.
Two track jacks, double acting, with a lifting capacity of 10 to 12 tons.
Two claw bars, weighing about 30 lb.
Six spike mauls, weighing 9 lb.
One spike puller (2 or 3 knob, depending on the height of the rail).
Seven diamond-pointed lining bars, weighing about 25 lb.
One pinch bar, weighing about 2 lb., suitable for nipping rails and may be used for a lining bar also.
Four tie tongs.
One dozen T tamping picks for stone ballast sections, weighing 7½ to 8 lb.
Eight clay picks for light ballasted sections.
One dozen tamping bars, weighing about 13 lb., for gravel or cinder ballast.
Two adzes, clay pick eye, square or round pole, end 6 in. bit.
One double-face striking sledge, weighing 12 lb.
Four rail tongs weighing 16 lbs.
Six track chisels.
One geared rail drill and 6 bits of suitable sizes. (Where two sections have headquarters at the same station, only one drill should be supplied for both.)
One broad hand axe, with a 4-in. bit.
One hand saw.
One chopping axe.
One claw hammer.
One measuring tape.
Four eight-tine stone forks.

For terminal gangs add to the above:

One light rail bender or "jim crow."
One portable rail saw.
Two rail dollies.

All sections should be furnished water pails, kegs, etc., as local conditions make necessary. They should also be furnished with a portable tool grinder.

Ballasting gangs should be furnished with two 15- and two 10-ton jacks, of the double-acting type, with an 18-in. lifting bar on the 15-ton jack and a 12-in. bar on the 10-ton jack. A complement of tools, sufficient for the number of men employed, must be at hand and should include spike mauls, claw bars, lining bars, wrenches, shovels, picks, tie tongs, tamping bars, gages, levels and a spot board.

For reballasting with gravel or cinders, the use of square pointed shovels, and the ordinary tamping bars with solid handles is thought to be most efficient, while in the application of stone or slag ballast (crushed) round-pointed shovels have advantages over the square-pointed ones, while the diamond stone tamping bars with spear ends and solid handles and weighing about 16 to 18 lb. are believed to be superior to tamping picks or the common square-faced tamping bars. Spades are used to good advantage in applying stone ballast, but the round-pointed shovels are of equal value in placing ballast under the track and also have a desirable shape for handling the ballast at all times.

For rail-laying gangs, the number of tools furnished will depend on the number of men employed, the class of tools which we would suggest as necessary being as follows:

Track laying machine, which in relaying rails can be handled with a comparatively small number of men, making a considerable saving as against the use of tong gangs.
Adzes; the use of adzes with clay pick eye and square pole end suitable for driving spike stubs, and with a 6-in. bit is considered good practice on account of the importance of adzing ties so that new rails will set to proper bearing.
Claw bars; good claw bars, *always kept in good condition,* are essential to good work in relaying rail.
Wrenches; ratchet wrenches have not come into general use, but they would be advantageous for rapid bolting of track, the tightening to be done more carefully by the use of ordinary track wrenches.
Track chisels; the frequent necessity for track chisels by a rail laying gang makes essential the supplying of first-class heat-treated tools.

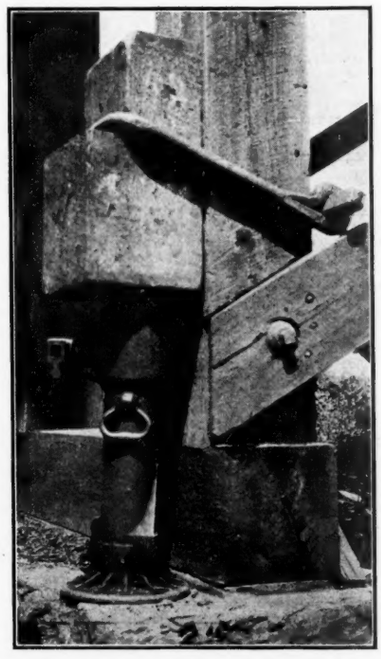
The proper repairing of track tools such as chisels, claw bars, spike mauls, etc., which must go through a tempering process is a most important matter, and should be entrusted only to first-class workmen. On important divisions it has been found economical to employ a special tool man at the supervisor's headquarters to do the blacksmithing on these tools. Such a man making a specialty of track tool repairing, taking suggestions from the men who use the tools, and going carefully into details of any failures, can do much toward getting the full life from each article. It is believed that the repairing of track tools under the direction of track supervisors or roadmasters will be found a better plan than having it done at the general shop under the direction of men who are not familiar with their use.

THE SELECTION AND USE OF BRIDGE AND BUILDING TOOLS

BY S. C. TANNER
Master Carpenter, Baltimore & Ohio, Baltimore, Md.

The subject of tools for use by the bridge and building forces in the maintenance of way department is of much importance and is unfortunately too often neglected. To derive the greatest degree of efficiency from the labor, only the best tools should be employed and in sufficient quantities to insure uninterrupted performance of the men employed and the quick and free movement of traffic. Due to the diversified character of the work to be done by the bridge and building forces, the number of tools required is correspondingly large and while many of them can be used universally for various kinds of work, it is better economy to provide special tools for special work, as such work can then be performed more quickly, cheaply and safely.

A bridge and building gang on maintenance work usually consists of a foreman and from 10 to 14 men, who are assigned to sections with headquarters located preferably at terminals and junction points if not too far from the bulk of their work. The duties of the gang should include the repair and renewal of all bridges and buildings in the section and with a proper organization they should be able to do all classes of the work. It is necessary, however, to provide them with the proper tools, including the necessary construction cars, and in most cases this should include the equipment shown in the list given below. New tools should be provided from time to time as improvements are made, when it is found that they are of such a character as to make labor lighter and cheaper, bearing in mind at all times that all tools should be of such a design that their use does not involve any danger to the men or to the structures.



Post Clamp in Position for Jacking

As the work of the section bridge gangs and the extra bridge gangs is practically the same in maintenance, the tools and equipment should be the same, except where special work requires the use of hoisting engines and derricks. These should be classed as system equipment, to be available for transfer from one gang or division to another. System equipment should consist of pile drivers, hoisting engines, derricks, concrete mixers and such tools as may be required to handle heavy work. They should be of the highest class and the latest design to be had on the market, especially where the work is to be done under traffic.

In all well organized bridge gangs there ought to be at least one man who is a good blacksmith or who is good at nearly all trades. He could be known as the tool man and should look after the tools and see that they are in a fit condition for use at all times and in safe working order. By so doing he can repair the tools when needed and avoid sending them to the shops or ordering new tools to replace them. Thus he will insure greater life of the tools and increased safety in their use.

The foreman should see that all tools are properly marked and accounted for each night. They should either be locked up in the tool boxes on the work or placed in the racks provided for them in the tool cars. The foreman should also observe personally the use of the tools to be sure that they are not overstrained or overworked and should instruct his men relative to the proper use and the safe loads which they will carry. Many bridge men will frequently overload jacks. Where one man cannot work the lever, two or three will sometimes help him, with the result that the jacks are frequently injured beyond repair. It is safer and more economical to use more jacks or other tools to lift the load than to overstrain them. This same feature should be guarded very closely when using tackle blocks and rope. This equipment is of great importance to bridge gangs and as few bridge men are familiar with them, special instructions are of material assistance. In accordance with this idea, the Baltimore & Ohio issues drawings to its bridge foremen showing the proper methods of tying knots and slings and the allowable load on blocks, ropes, etc.

EQUIPMENT FOR A MAINTENANCE BRIDGE GANG.

One sleeping coach equipped for 15 men.
One dining and cook car equipped for 15 men.
One tool car.
One material car.
One portable tool box, 2 ft. 6 in. by 2 ft. 6 in. by 6 ft. for rough tools.
One portable tool box, 18 in. by 2 ft. by 6 ft. for sharp edged tools.
One gasolene motor car.
One heavy truck car.
One heavy truck car with mounted hoisting crab and boom as illustrated in the *Railway Age Gazette* of Aug. 16, 1912.
Two one- or two-wheeled timber trucks or dandy cars to run on rail for handling heavy timber or other material.
Six timber dollies.
Five timber carrying hooks.
Eight timber cant hooks.
Two 50-ton ball bearing screw jacks.
Two 30-ton ball bearing screw jacks.
Two 20-ton ball bearing screw jacks.
Four double screw 14-in. telescopic jacks.
Four large pulling jacks.
Four 10-ton double action ladder jacks.
Four track jacks.
Eight 10-in. track shovels.
Five clay picks.
Two 6-ft. clay chisel spudding bars.
Five 5-ft. cross cut saws.
Six chopping axes.
Two 1-in. double crank ship augers.
Six 13/16-in. double crank ship augers.
Six 11/16-in. double crank ship augers.
Two 9/16-in. double crank ship augers.
Four track claw bars.
Two bridge shackle bars for pulling drift bolts.
One bridge shackle jack for pulling drift bolts.
Six track lining bars.
Six 1 in. by 4½ ft. octagonal steel bars with one chisel point and one diamond point.
Four 1¼ in. by 4½ ft. octagonal steel bars with one chisel point and one diamond point.
Two hammer bars to be used as rams for driving drift bolts in places that men cannot get to with handle hammers, made by upsetting each end of a track lining bar, making a 2½-in. hammer face on one end and a 1-in. hammer face on the other.
One double-faced, 16-lb. hammer.
Two double-faced, 10-lb. hammers.
Four double-faced, 8-lb. hammers.
Four double-faced, 6-lb. hammers.
Four track spiking hammers.
Four 3-lb. pin hammers.
Six rail cutting chisels with handles.
Five 1¼ in. by 2 ft. octagon chisel bars.
Two 1¼ in. by 4 ft. octagon chisel bars.
One track level.
One tripod telescope with targets for establishing line, grade and surface on bridges, as illustrated in the *Railway Age Gazette* of Dec. 20, 1912.
One track gage.
Six ½ in. by 9 ft. chains with a ring at one end and a grab hook at other end.
Four post clamps for jack supports, as shown in the accompanying photograph.
Two 3-sheave 12-in. tackle blocks for 1¼-in. manila rope.
Two 2-sheave 12-in. tackle blocks for 1¼-in. manila rope.
Two 3-sheave 10-in. tackle blocks for 1-in. manila rope.
Two 2-sheave 10-in. tackle blocks for 1-in. manila rope.
Two 3-sheave 8-in. tackle blocks for ¾-in. manila rope.
Two 2-sheave 8-in. tackle blocks for ¾-in. manila rope.
Two 10-in. hinge snatch blocks for 1¼-in. manila rope.
Two 8-in. hinge snatch blocks for 1-in. manila rope.

Equipment for a Maintenance Bridge Gang (Continued.)

Two 6-in. hinge snatch blocks for ¾-in. manila rope.
600 ft. of 1¼-in. manila rope for tackle blocks.
600 ft. of 1-in. manila rope for tackle blocks.
600 ft. of ¾-in. manila rope for tackle blocks.
Two 1½ in. by 200 ft. manila rope for hand lines.
Two 1¼ in. by 200 ft. manila rope for hand lines.
Four 1 in. by 200 ft. manila rope for hand lines.
Four ¾ in. by 200 ft. manila rope for hand lines.
Six 1¼ in. by 6 ft. manila rope for slings.
Four 1 in. by 6 ft. manila rope for slings.
One portable blacksmith's forge.
Two sets of blacksmith's tongs.
One blacksmith's anvil.
One combination bench and blacksmith's vise.
One set of machine bolt stocks and dies from ½ in. to 1 in.
One ratchet drill and bits from ½ in. to 1 in.
One press drill for tool car with a set of bits from ¼ in. to 1 in.
Six 24-in. S wrenches for ⅝-in and ¾-in. bolts.
Four 16-in. monkey wrenches.
Two 12-in. monkey wrenches.
One large grindstone.
One tool grinding machine.
One oxy-acetylene torch for cutting iron.

The adze and small tools should be furnished by the men and maintained as their personal tools. The list each good bridge man should have is as follows:

One adze with 4½-in. bit.
One hand ax.
One hand hatchet.
One claw hammer
One 2-ft. steel square.
One 10-in. try square.
One 10-in. T bevel square.
One ratchet brace with bits.
One set of framing chisels.
One jack plane.
One fore plane.
One smooth plane.
One block plane.
One 4½-point rip saw.
One 7-point cut-off saw.
One 12-point cut-off saw.

TOOLS FOR THE WATER SERVICE AND BRIDGE AND BUILDING DEPARTMENTS

By E. M. GRIME
Supervisor of Bridges and Buildings, Northern Pacific; Dilworth, Minn.

On most railways the bridge and building department is responsible for the care and frequently for the construction of practically everything pertaining to the physical property of the railway except the roadway, track and signals. It is therefore always necessary to have available an organization capable of handling a large variety of work comprising many different trades. In order to handle this work economically it is usually found advisable to divide the organization into crews, each of which makes a specialty of certain lines, and the first essential for effective work is to provide each crew with sufficient tools of the kind and character best suited to the work.

A good arrangement of crews and the tools required by each may be stated as follows:

A water service crew, consisting of a foreman, assistant foreman and two helpers, augmented by additional laborers when needed for heavy work, will handle everything pertaining to water stations, the plumbing and heating of buildings, fire lines, hydrants, sewers, steam lines and air lines, as well as the maintenance of coal dock machinery. In addition to the kit of personal tools carried by the men, a gang should be provided with:

Taps and dies for all sizes of pipe from ¼ in. to 8 in.
Bolt taps and dies ⅜ in. to 1 in.
Pipe cutters for various sizes of cast pipe up to and including 14 in.
One pressure tapping machine for corporation cocks up to 1 in. size.
One No. 3 Edson diaphragm pump with two extra diaphragms.
One No. 2 Myers force pump with 100 ft. of rubber hose.
Two 5-ft. chain pipe tongs.
Two 24-in. Stilson wrenches.
Two 36-in. Stilson wrenches.
Two sets of calking irons.
One 12-in. lead melting pot.
One 8-in. lead pouring ladle.
One small blacksmith forge.
One anvil.
One each of 3-lb., 4-lb. and 5-lb. blacksmith hammers.
One 8-lb. sledge hammer.
One differential chain hoist of two tons capacity.
An 8-in. bench vise.
Ten clay picks with six extra handles.
Ten No. 2 shovels.
Ten long-handled, round-pointed shovels.
Five pairs of leather-soled hip rubber boots.
One boiler test pump.
Two 8-in. ratchet jacks.
One 5-ft. V-tooth cross cut saw.
Five steel tray wheelbarrows.
Two hack saws with 24 extra blades.
Two sets of ¾-in. wood tackle blocks.
300 ft. of ¾-in. four-strand manila rope.
One push car.
One 4-hp. gasolene motor car.

Concrete crews, consisting of a foreman, four carpenters and 15 to 20 laborers, handling all kinds of concrete work and particularly bridge abutments, concrete arch and box culverts, concrete trestle bridges, etc., should be provided with:

½ or ¾ yd. concrete mixer, direct connected to a steam or gasoline engine.
One No. 3 Edson diaphragm pump with four extra diaphragms.
One No. 2 Myers force pump.
Twelve pairs of leather-soled hip rubber boots.
Twelve steel tray concrete wheelbarrows.
Two sand screens.
100 ft. of ¾-in. garden hose.
Three 8-lb. mauls.
Two 8-in. ratchet jacks.
Three 5-ft. V-tooth cross cut saws and 12 10-in. saw files.
Four spading shovels.
Two sets of ¾-in. wood tackle blocks.
500 ft. of 4-strand manila rope.
Six lantern frames—four each of yellow, red and white globes.
Four red and four yellow flags.
24 torpedoes.
Four 24-in. steel claw bars for nails.
One grindstone.
One push car.
Two hand cars.
One gasoline motor car.

Carpenter crews, consisting of a foreman and 6 to 10 house carpenters and helpers, to handle repairs or construction of second class stations, freight depots, section houses, stockyards, grain and station platforms and all light carpenter work should be provided with:

Three 5-ft. V-tooth cross cut saws and twelve 10-in saw files.
Twelve 16-in. common screw jacks.
Two track jacks.
One small wrench.
Two sets of ¾-in. wood tackle blocks.
One set of 1-in. wood tackle blocks.
Two ¾-in. snatch blocks.
300 ft. of ¾-in. 4-strand manila rope.
300 ft. of 1-in. 4-strand manila rope.
Four 5 ft. 4 in. by 1⅛ in. octagonal steel pinch bars.
Five peavies with two extra handles.
Five carrying hooks, one extra handle.
Two pairs leather-soled hip rubber boots.
Ten No. 2 shovels.
Six clay picks.
One grindstone.
Ten long-handled, round-pointed shovels.
Two 24 in. by ⅝ in. steel claw bars for nails.
Two post hole diggers.
One No. 3 Edson diaphragm pump with one extra diaphragm.
Two 8-ft. chains of ⅜-in. iron with ring and hook.
Six lantern frames with four each of white, red and yellow globes.
Four red and four yellow flags.
24 torpedoes.
Two 8-lb. mauls.
Two 12-lb. mauls.
One No. 3 Merrill's saw set for single tooth cross cut saws.
One push car.
One 4-hp. gasolene motor car.

A painting crew, consisting of a foreman and six to eight painters, to handle all painting, except high steel trestles, should have constantly on hand:

Twelve 4½-in. round paint brushes.
Twelve 4½-in. flat paint brushes.
Twelve stencil brushes.
Twelve lettering pencils.
Twelve scraping knives.
Six steel wire brushes.
One belows for sanding.
Four kalsomine brushes.
Two 16-ft. extension ladders.
Four 5-ft. staging hooks.
Four sets of ½-in. tackle blocks, single and double sheave.
500 ft. of ½-in. manila rope.
Two sets of ¾-in. tackle blocks.
300 ft. of ¾-in. four-strand manila rope.

A bridge crew, consisting of a foreman, pile driver, engineer and seven bridge carpenters and helpers, is required to handle repairs or the rebuilding of timber pile and trestle bridges, wooden water tanks and coaling stations, the placing of steel girder bridges, moving buildings, repairing washouts and sometimes clearing wrecks. This is the most important crew, as it is depended upon for practically all heavy work. To it is assigned a pile driver, and frequently a wrecking crane. The tools required by this crew are as follows:

Four 10-ton ratchet jacks.
Four 15-ton ratchet jacks.
Eight 8-in. ratchet jacks.
Twelve 16-in. common screw jacks.
Two track jacks (Barrett No. 1).
Two ratchet pulling jacks.
Eighteen 6-in. maple rollers.
Two sets of 1-in. tackle blocks, single and double.
One set of ¾-in. tackle blocks, single and double.
400 ft. of 1-in. four-strand manila rope.
200 ft. of ¾-in. four-strand manila rope.
200 ft. bell cord.
Two 1-in. snatch blocks (steel).
One ¾-in. snatch block (steel).
Six octagonal steel pinch bars 1⅛ in. by 5 ft. 4 in.
Two claw bars for track bolts.
Two 24 in. by ⅝ in. steel claw bars for nails.
Two shackle bars for ⅞-in. drift bolts.

Ten peavies, 12 extra handles.
Six carrying hooks, 2 extra handles.
Two hand axes.
Six chopping axes.
Two adzes.
Four spike mauls.
Twelve No. 2 shovels.
Twelve long-handled, round-pointed shovels.
Twelve clay picks, 4 extra handles.
Two post hole diggers.
One No. 3 Edson diaphragm pump.
One No. 2 Myers force pump with 100 ft. water hose.
Three 5-ft. V-tooth crosscut saws.
Three 6-ft. V-tooth crosscut saws.
Twelve 10-in. saw files.
One No. 3 Merrill's saw set for crosscut saws.
Four 8-ft. chains of ⅜-in. iron with ring and hook.
Two 8-lb. mauls.
Two 12-lb. mauls.
Two 16-lb. mauls.
Six extra maul handles.
Six lantern frames with four each red, white and yellow globes.
Four lanterns with reflectors.
Four red and four yellow flags.
24 torpedoes.
Two chisel bars, 3½ in. by 1 in., 6 ft. long.
Two 16-in. monkey wrenches.
Two track wrenches.
Two 24-in. Stilson wrenches.
Four S wrenches to fit bolts in general use on bridges.
Six 13/16-in. bridge augers.
Three ⅝-in. bridge augers.
Three ½-in. bridge augers.
Two ⅝-in. steel drifts, 24 in. long.
Four 5-ft. staging hooks.
Grindstone.
One set of bolt taps and dies, ½ in. to 1 in.
One track level.
One track gage.
Four timber dollies.
One track dollie.
Six pairs of leather-soled hip rubber boots.
Four track chisels.
Small blacksmith forge.
Anvil.
Bench vise.
Four 2-gal. oil cans.
One 1-qt. oiler.
One Buckeye light of 1,000 c.p.
Four straight edges of clear white pine, 1¼ in. by 10 in. by 16 ft.
One push car.
One 4-hp. gasolene motor car.

The work of sharpening or repairing tools in all crews should be reserved for stormy days, when little can be accomplished in the field. The foreman should be required to turn in such tools as cannot be readily repaired and they should be promptly replaced from the storekeeper's stock or by order on the purchasing agent. To avoid personal injuries a defective tool should never be allowed to remain in use and the men should be encouraged to report any defects. Successful contractors provide their men with plenty of first class tools and equipment and experience has shown that the best results are obtained in the bridge and building department by following the same practice.

DESIGNING MANGANESE STEEL TRACK WORK

BY V. ANGERER
Vice-President, William Wharton, Jr., & Company, Inc.,
Philadelphia, Pa.

When manganese steel was introduced into special track work such as frogs and crossings on steam railroads 15 years ago, it necessarily took a long time before its economic value was generally appreciated. It was a new proposition for a railroad to install a manganese steel track structure costing 2½ or even 4 times as much as the material it had been using theretofore, and to expect economical results. Each railroad that ventured a trial on the representation of the manufacturer, or on what it had heard concerning the results obtained elsewhere, wanted a demonstration under its own observation. This consumed time. Within the last 8 years, however, the important economies that can be effected by the use of manganese steel frogs, crossings and switches in maintenance have been more fully recognized and the demand for them has greatly increased. It has been estimated that in 1913 approximately 18,000 manganese steel frogs, 1,300 manganese steel crossings and 2,000 manganese steel pointed switches were bought by the steam railroads of this country, and while in 1914 these figures have fallen off, owing to the general condition of business and the retrenchment of the railroads in particular, there is no doubt but that they will be exceeded in the next few years.

Unfortunately, when the demand grew, and numerous track work builders took up the manufacture of manganese steel track structures, the tendency was displayed to try to cheapen the work at the expense of the product. The hesitation of the railroads to make so much larger first investment in track structures over what they were accustomed to pay in ordinary work, made it appear desirable to reduce the ratio of difference to promote the use of manganese steel work. It was a mistake, probably due to the inexperience of some manufacturers, but into which even some of the older track work manufacturers fell, in their endeavor to meet competition. The result was almost the opposite to that intended.

Also in some cases the railroads who had found manganese steel work entirely satisfactory induced the track work manufacturer to undertake to make more difficult pieces than they had ever made before, for the elimination of joints and other anticipated maintenance advantages. Under the pressure from both sides, the manganese steel founders allowed themselves to attempt the making of castings of proportions which were not productive of the best results. The consequences were some failures and cases where manganese steel did not prove a success. Every such case apparently stood out prominently against the use of manganese steel work, notwithstanding the hundreds of other cases where it had given perfect satisfaction and effected great economy, paying for itself several times over in comparison with ordinary work.

The critical stage which was brought about by these causes has now been passed. The manganese steel founders and track work manufacturers have gotten together and secured the interest and co-operation of the railroads, through the track committee of the American Railway Engineering Association. This has resulted in certain minimums being established in the proportions of the manganese steel castings for the various track structures below which satisfactory results can hardly be expected. The founders of manganese steel have also profited by experience and improved their methods toward making the castings suitable for the hard service for which they are intended. Patterns and designs are scrutinized more closely now as to whether they suit foundry practice, and whether a casting of proper quality in manganese steel can be produced from it.

The main mistake frequently made in designing manganese steel track work was that they were based on theoretical calculations as to the necessary strength and an endeavor to provide for a large amount of wear without due regard to the foundry problem. The shrinkage of manganese steel from the fluid to the solid cold state is considerably more than that of other metals, such as iron and ordinary steel. Roughly speaking, it is 5/16 in. to the foot. This means that a casting of 10 ft. in length is over 3 in. longer when poured in the mold than after it has cooled. Thick portions take longer to cool than thin portions and therefore do not contract as quickly. This presents a problem that must be taken care of, not only by the foundry practice, but by the design, otherwise uneven shrinkage, shrinkage cracks, and resulting segregation and unsoundness of metal or internal strains are unavoidable, and an improper design may defeat all the ingenuities of the foundryman. These dangers are aggravated by the fact that manganese steel is what might be called red short, i. e., in the red hot state it is extremely brittle and weak and subject to cracking. This requires special treatment of the castings in the molds, only gained by experience, and being quite different from the treatment of ordinary steel castings.

When the castings undergo the subsequent heat treatment, further problems are met. Thin castings are affected differently from thick castings when both are subjected to exactly the same heat treatment. Consequently thin portions of a casting may be differently affected than the thick portions of the same casting, if the variation in thickness is considerable. It is for this reason that the practice to cast coupons on the castings for

the determination of physical properties, which is the usual practice with ordinary steel castings, is not followed in manganese steel castings, as the difference in heat treatment required by the thin coupon, when attached to a casting of greater thickness, would result in different properties being developed in the test coupon from those of the main casting. Thus, the treatment given a casting must be gaged by experience, according to the nature of each individual casting, or group of castings, particularly in reference to the thickness of metal.

The castings come out of a heat treatment usually very much distorted and bent, and have to undergo a straightening process, under powerful presses, to put them back into shape. The degree of this distortion often depends largely upon the design, and in long, complex and spider-like track castings, is often quite aggravated, so that the straightening process becomes very difficult and hazardous. Internal strains and, in fact, internal fracture, with no outside indication thereof, may be the consequence, destroying all theories as to the strength of the piece. All such difficulties and dangers should be given due consideration in the design. By special precautions the foundry can overcome the detrimental effect which may be due to some feature of the design, but may not be able to avoid it altogether.

Heavy or thick portions in some parts of a casting may be just as objectionable as too thin portions. Ribs intended to strengthen portions of a casting may have the opposite effect, producing incipient cracks. No actual fixed rules can be laid down for designing manganese steel track castings, except a few cardinal principles which might be summed up as follows:

Make the sections of a casting and the thickness of metal in the section as uniform as possible.

Make changes from one section to another and from one thickness of metal to another gradual. Avoid abrupt changes and all sharp corners.

Avoid all possible projections, brackets or cross members which may form a serious impediment to the free contraction of the casting in cooling in the mold. Before deciding upon an unusual design, consult the foundryman.

After a piece has been cast successfully, the wearing qualities so essential to track work have to be imparted to it through the heat treatment. Manganese steel derives its remarkable wearing qualities through a combination of hardness and ductility. It may be of interest to the designer and maker, as well as to the user of manganese steel track work, to have pointed out a few peculiarities of this remarkable metal. The hardest castings may not always be the best wearing ones. The particular value is in its great resistance to abrasion. In its toughest and most ductile state, manganese steel has somewhat of a tendency to flow under cold rolling or pounding. In track work this sometimes causes the appearance of initial wear, due to this action of the skin, which usually is slightly tougher than the rest of the castings. Such initial wear is no criterion of the subsequent wearing qualities of the piece. Blow holes are a rare occurrence in manganese steel castings, as, owing to the chemical composition of manganese steel, it is quite free from gases in the molten state. While never desirable, small cracks need not cause any such apprehension as in an ordinary carbon steel casting. It is a very well known fact, and pointed out by eminent authorities as Dr. H. M. Howe, that owing to the toughness of manganese steel, cracks do not readily propagate. A sudden parting of a manganese steel casting, properly heat-treated and toughened, need never be apprehended under almost any strain to which the pieces are subjected in the track. Even if physical tests for ultimate tensile strength or elastic limit could be made readily, in view of the difficulty of machining test pieces to proper sizes, they would form no criterion for the strength of the pieces. The necessary strength and solidity of a manganese steel track casting depends mostly upon the design and its wearing qualities upon the proper heat-treatment given to it by the metallurgist.

A PNEUMATIC TIE PEELER

In the past the removal of bark from railroad ties has always been a costly and laborious hand operation. From information gathered from contractors it has been found that when working on fresh timber the most expert tie peeler is capable of peeling by hand an average of but 100 ties per day of 10 hours, for which production he receives comparatively high wages. The output of the average tie peeler is from 40 to 60 ties per day, and he also receives a wage considerably in excess of that demanded by the ordinary laborer. The generally prevailing price paid is 5 cents per tie.

The search for means to reduce this cost led to the development by the Ingersoll-Rand Company, New York, of the "Imperial" tie peeling tool, used in conjunction with an "Imperial" pneumatic hammer. Experiments have shown that with this tool an ordinary laborer had no difficulty in thoroughly peeling from 150 to 200 ties per day, and at a wage rate far below that received by the expert hand peeler. Inexperienced men who had never used an air hammer nor seen a tie peeled were used in the tests. They were able to peel a standard seasoned tie with this tool in an average time of less than three minutes.

Portable Plant for Peeling Ties

A complete installation for pneumatic tie peeling comprises the two tools already mentioned and a small "Imperial" vertical single-acting air compressor, with 6 in. diameter by 6 in. stroke, a small air receiver, suitable valves, piping, hose, etc. It costs approximately $300. The compressor has sufficient capacity to operate the two tools simultaneously if necessary. An accompanying photograph shows the pneumatic tie peeler at work. The compressor may be installed in some convenient place and is driven by a belt from the line shaft. The extra load imposed upon the power plant is scarcely perceptible. Another illustration shows a portable plant.

Pneumatic Tie Peeler in Use

By the insertion of other tools the hammer also has other useful applications, such as the chipping and calking of metals, while by the addition of other pneumatic tools the air compressor can be used for such work as portable drilling and boring and general repair work.

The Chattanooga Creek Bridge of the N. C. & St. L.

Interesting Substructure Work on a 15-track Structure Involving the Use of a Drag Line for Excavation

By C. H. Johnson

Engineer of Construction, Nashville, Chattanooga & St. Louis, Nashville, Tenn.

The Nashville, Chattanooga & St. Louis has recently completed high masonry abutments for a 15-track deck girder bridge across Chattanooga creek at the point where it flows into the Tennessee river, which involved interesting construction methods. Only four of the girder spans have been placed at present, two of which replace a three-track pile trestle, one replaces a main line truss bridge, while one is for new second track.

The creek originally flowed under the tracks at a very acute angle, and the first plan adopted for the new structure provided for changing the channel to permit the use of two 25-ft. arches at right angles to the main track. After considerable excavation had been made to carry out this plan, objections were raised by certain citizens of Chattanooga on the ground that the proposed structure would interfere with the navigation of the stream. The matter was taken up with the War department, the objections of the citizens were sustained, and a change in plan was ordered. This resulted in the adoption of plans providing for deck girders resting on concrete abutments. The abutments are of the cantilever type. The base is 5 ft. thick by 31 ft. wide, and the vertical wall 5 ft. thick by 56 ft. high, while 5-ft. fillet connects the vertical wall and the base. Reinforcement consists entirely of second-hand 56-lb. rail spaced 9 in. center to center in both the base and vertical walls. The fillet is reinforced with short pieces of rail placed 18 in. center to center on a batter of 1 to 1. No reinforcement was used in the walls above the tops of the 30-ft. rails, which were carried to the bottom of the foundation slab, the tension in the wall above this point being taken care of by the concrete.

The girders are placed parallel to the tracks which they support, and, as there is a difference in the angles which the various tracks make with the walls, these girders vary in length. They are floored with creosoted timber and the regular track construction on rock ballast is used across them.

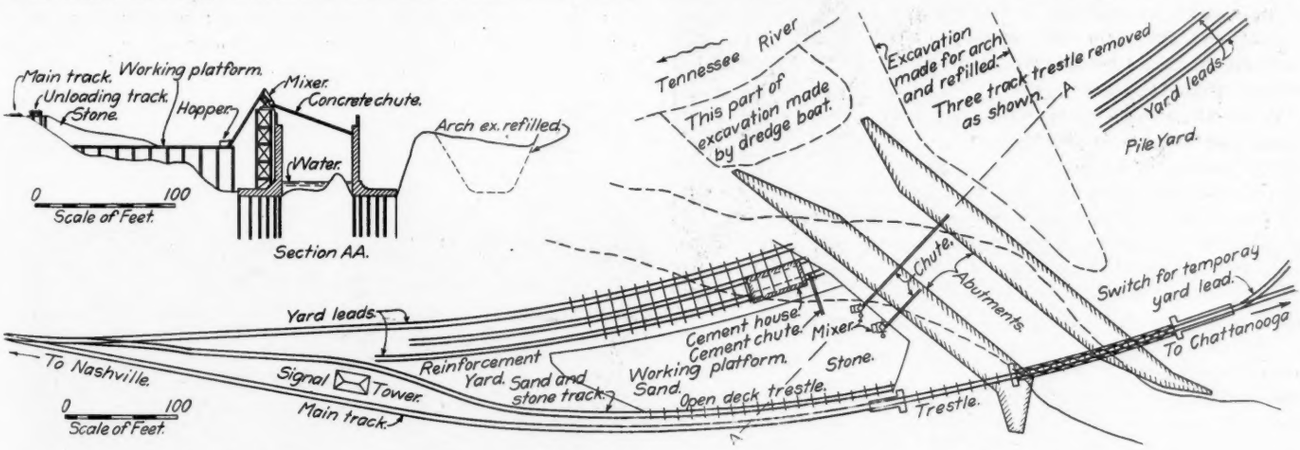
One of the piers of the old truss bridge was directly in the line of the north wall, which necessitated a special design at this point as it was impossible to place the horizontal reinforcement for a footing. Consequently a gravity section was used to a height of 30 ft. and the old pier was incorporated in the new wall.

EXCAVATION

The plans as finally adopted called for the excavation of 40,000 cu. yd. of material, about two-thirds of which was on the south side of the creek. The excavation had to be taken out to about 5 ft. below the water surface and the maximum depth of cutting was 42 ft. A Bucyrus drag line with a working radius of 70 ft. horizontally and 50 ft. vertically was rented from a contractor, who also furnished the men to operate it. The excavation made for the two arches as originally planned was refilled by this machine, a half-inch stream of water being thrown on the material as it was dumped from the bucket. As the material was already wet, part of it coming from below the water surface, this stream proved sufficient to make it flow so as to fill the entire excavation. The expense of operating the machine was as follows:

Rent of machine	Per day,	$25.00
Foreman	"	4.00
Engineer	"	6.00
Fireman	"	3.60
Six laborers	"	10.50
Pumper	"	2.00
Watchman	"	3.00
Machinist	"	4.00
Coal, repairs, oil, etc.	"	5.90
Total		$64.00

The total cost of excavating 40,000 cu. yd. was $9,739.87 or 24.4 cents a yd. However, about half the material had to be handled twice on account of the difficult location of the work, and allowing for this the cost was 16.2 cents per yd. of material handled. This rather high price for drag line work was due to the fact that it was necessary to pull the old piles with the machine and also because of the many boulders which were encountered.



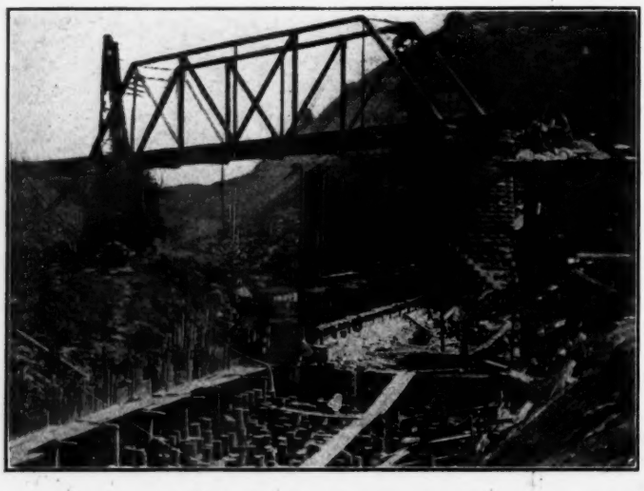
Plant Layout at the Chattanooga Creek Crossing of the Nashville, Chattanooga & St. Louis

PILE DRIVING

No suitable natural foundation could be secured, the creek bed being made up of boulders from the mountain side for a great depth, so it was necessary to use piles. The specifications for the piles provide for any kind of timber 8 in. tops and 12 in. butts. The cut off of the piles is at the old low water line so that they will be submerged at all times. The piles were driven with a 4-ton steam hammer handled by a 20-ton locomotive crane, operating on a short section of trestle work built on foundation piles sufficiently high to keep the track above any expected stage of water. An attempt was made to use a floating driver, but as the only barge available proved too small, and the men demonstrated their inexperience in handling boats, the attempt was abandoned, after 24 hours' trial. The failure of this plan occurred at a critical time. The excavation

for the new wall having been completed behind the old pier and under the main line approach trestle, the mountain side above began to slide and endanger the main track. It was necessary to build a short section of the wall promptly in order to stop the slide, and before this could be done the foundation piles had to be driven. As an emergency measure, the drag line was moved into position, the bucket was taken off and the machine used as a crane to handle the 4-ton hammer. This was a heavier load than the machine was designed to handle, but it did the work very well. Piles were driven day and night and the short section of wall was completed in time to prevent serious results from the slide. In the meantime the locomotive crane was provided to finish the driving.

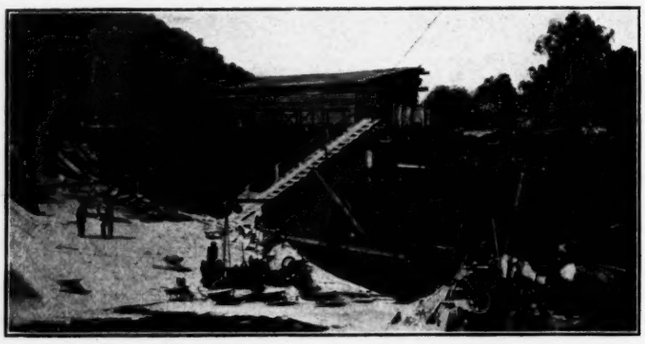
The pile driving gang consisted of 14 men and a foreman, and 2,700 piles were driven, the penertation varying from 5 ft. to 30 ft. sometimes in adjacent piles. This great variation made the driving slow, as it was necessary to use piles long enough for the greatest depth, and they had to be cut off if they failed to penetrate the full distance before the adjacent pile could be driven. The pile driver expense was about $50 a day, and with an average of 35 piles driven a day the cost of driving per pile was $1.40. On account of the great variation in penetration no accurate estimate can be given of the cost per foot, but assuming an average penetration of 15 ft. the cost would be 9.3 cents a driven foot. The above prices include the cost of temporary trestle work, the cost of installing the machine and the cost of unloading the piles, framing them in the yard and transporting from the yard to the machine.



General View Showing Construction Progress

CONCRETE WORK

All concrete work was of 1-3-5 mixture, the aggregate being crushed limestone. Sand and stone were delivered on the work in drop-bottom cars, which were dumped from a trestle built over the material bin. Soaked cement was unloaded by hand into a cement house built on the three-track trestle referred to above. Two No. 6 Chicago Cube mixers equipped with charging hoppers were placed on a wheeling platform which was formed by extending the floor of the sand and stone bins, and which was about 20 ft. below the bridge seat. Sand and stone were placed in the hoppers from measured wheel-barrows and the proper amount of cement added. For a large part of the work the mixers dumped directly into chutes, consisting of wooden troughs lined with sheet iron. It was found by experiment that the best inclination for chutes of this kind was 4 in. vertical to 12 in. horizontal, any steeper slope than this had a tendency to separate the mixture, while a lighter slope was not sufficient to make the concrete flow readily. A tram track was built just outside of each wall, and when the wall became too high for the chutes the concrete was delivered in drop-bottom cars of about one cu. yd. capacity each, one car being used for each mixer. A small receiving hopper holding about ¾ cu. yd. was built at the mouth of each mixer so that no delay occurred while the car was making the trip. Two men were required with each car to push it to place, dump it and return to the mixer. Before resorting to the use of cars the mixers were raised to the height of the bridge seat, without interfering with the material bins and wheeling platforms.



The Concreting Plant

This was accomplished by extending the guides for the charging hoppers enough to reach the new position of the mixers and using a larger cable for hoisting.

Old car sills 30 ft. long were used for posts and braces for the lower part of the wall, to which the casing, consisting of 2 in. dressed lumber for the face and 2 in. rough lumber for the back of the wall were nailed. Above a height of 30 ft. the casing was nailed to studding 5 ft. long and was bolted into place by rods running through the wall. After the concrete had set the casing was taken off in sections and used again, while the rods were simply cut off at the face of the concrete, no provision having been made for removing them. The 5-ft. wall required considerable yardage per square foot of form surface, and it was possible to keep ahead of the concrete work with a small force of form men. This term is used for the reason that there was no carpenter on the job, the form gang consisting of an experienced concrete man assisted by 4 or 5 common laborers. The mixing gang was composed of 21 men for the two mixers working as follows: 8 hauling stone, 4 haul-

The Drag Line Excavator at Work

ing sand, 2 on the charging hoppers, 2 dumping mixers, 1 hauling cement and 4 hauling concrete. From 2 to 6 men, depending on speed of mixing, were used for placing concrete and spading it away from the forms.

A large part of the concrete was placed with the temperature about 20 deg. F., necessitating the heating of the sand and stone to prevent freezing. This was done by building a grid-iron consisting of 1½ in. pipe laid about 30 in. center to center on the full length of the bin floor and passing steam through it. Steam was supplied from a small vertical boiler belonging to a hoisting engine.

The abutments contain 8,071 cu. yd. of concrete, and cost $5.03 a cu. yd., exclusive of excavation and pile foundation, this figure being made up as follows:

Labor mixing and placing concrete	$1.22
Concrete material, including unloading, etc.	3.12
Labor building forms	.33
Material for forms	.33
	$5.03

The cost of placing about 30,000 lin. ft. of 56-lb. rail and 5,550 lb. of rods is included in the above figure. The pile foundation cost $1.10 a cu. yd. of concrete.

PORTABLE GRAVEL SCREENING AND WASHING PLANT

By Mac Rae D. Campbell.

Although nature has been very lavish in distributing materials suitable for use as aggregate in concrete construction, nevertheless most, if not all, bank-run material should be screened so that fine and course volumes may be properly reproportioned before using in concrete mixtures to secure dense, hence water tight concrete. Likewise, many bank deposits contain foreign matter such as clay or loam, rendering the material unfit for use unless washed. Sand and gravel may be found near the site of the contemplated work, but if facilities for washing dirty material are not available haul of varying length is involved to bring suitable materials to the site of the work.

Engineers now realize the important part that aggregates play in concrete construction. Economies resulting from applying any simple and practical method to make otherwise unsuitable material available for concrete work will soon represent a sum that would absorb the cost of a portable gravel screening and washing plant such as shown in the accompanying plan. The plant shown in the accompanying drawing is estimated to cost about $2,000 for a capacity of screens of 350 cu. yd. per day.

Timber used in this construction should be selected stock that will permit the repeated setting up and dismantling of the plant with the least injury to the units of which it is composed. Working out the details of the design carefully for the cutting and boring of timbers will insure that most, if not all, of the units can be assembled by bolts, dowels and lag screws. Materials forming bin bottoms and sides or ends can be assembled so as to make units of these portions of the construction that in turn can be erected quickly, and dismantled with equal ease. The size of bins will be regulated by the necessity for storing any considerable quantity of material, also by the capacity of the plant. An additional amount of bracing beyond that shown in the drawing will take up any lost motion that might result from poor fit of the parts, although proper detailing at the time of laying out. the work will prevent the necessity for this.

A suitable area should be cleared off at the pit or site of the deposit where such a plant is to be erected and bridge timbers or cribbing used for a foundation. It will be well to mark every piece of timber or unit of the plant, either at the time of erection or just before dismantling the plant for the first time, to designate its proper place in the construction and thus insure economy of time when necessary to re-erect the structure. Portability and convenience are prime requisites if the design is to serve its intended purpose. Many short cuts will, no doubt, suggest themselves while detailing the construction preparatory to cutting timber and erecting.

The method of charging the elevator will depend upon the conditions and upon the amount of money that it is desired to invest in loading equipment, or on the kind of loading equipment that may already be available. The drawing shows team runways leading to the hopper, but the hopper can also be loaded by means of a derrick, and a clam-shell or orange-peel bucket, a locomotive crane, a small steam traction shovel or industrial cars. The last would hardly be employed unless it was intended to use the plant at one locality for a considerable length of time. Screens, shafts, sprockets, pulleys, etc., can be obtained in the open market, yet most of such equipment could be turned out in the railroad shop. Sprockets, spur gears and pinion gears can, in nearly every case, be obtained of suitable size from a manufacturers' standard stock.

The general operation of preparing sand and gravel for use as concrete aggregate consists first of excavating the material from the bank deposit or elevating it from the beds of streams, transporting it to the washing plant, where it is elevated to a hopper located directly above suitable screens, dumping it into these screens, and playing upon the material water under pressure, which, in connection with the agitation of screens, causes rolling and tumbling of material and accomplishes its cleansing. From screens the material may be passed into bins unless used as coming from the hoppers.

Screening, washing, and, where necessary, crushing, are accomplished by using any one of several types of screens and a type of crusher that seems most desirable for the material to be handled. Screens can be grouped under the head of gravity, reciprocating, and rotary. Gravity screens are so named because the material rolls down their face by weight alone, the screens being fixed. Experience has generally proved that gravity screening plants are not as satisfactory in all cases as other types in securing a product possessing all desirable qualities. This is due largely to the great variety of material found in different pits and even in different parts of the same pit.

Reciprocating screens are a marked improvement over gravity screens, especially as regards subsequent sizing of the materials. They have long been used successfully in coal and ore mining plants. The application of reciprocating screens to gravel and sand sizing and washing has, however, been limited. Such screens are at times arranged so that the operating angle may be changed to meet different requirements arising through variations in the composition of material. In using reciprocating or vibrating screens the material to be handled must be distributed evenly across the face of the screens and be fed upon it at a uniform rate; also, the oscillating or vibrating motion must be greater at the feed than at the discharge end because of the greater quantity handled. When properly designed and erected, such sereens will produce satisfactory separation of fine and coarse materials.

Rotary screens are of four general kinds: Straight-cylindrical, conical (used in an inclined as well as in a horizontal position), the combined cylindrical and conical, so-called because incorporating both forms, and the multiple conical. Cylindrical screens are made by attaching perforated sheet metal or wire cloth to circular metal frames, the size of the perforations being governed by the grading of the output desired.

To obtain material properly sized for construction which requires coarse aggregate from ¼ to 1½ in. and washed sand from ¼-in. to that which will be retained on a No. 100 mesh screen, perforations are, in the majority of cases, 1½-in. round holes in the first conical screen, the same size in the inner skirt, or screen, and ⅜-in. diameter in the next screen. Material from this last screen should then be discharged into a settling tank.

Wherever a grading of material is required which lies between ¼ and ½ in. or ¾ and 1 in., the material must pass through a screen with 1-in. or ½-in. perforations, and be retained on a screen having 5/16-in. perforations. It must be remembered, however, that unless a very large percentage of the material lies between ¼ and ½ in. or ¾ and 1 in., as it comes from the pit, this grading cannot be secured in the same operation that pro-

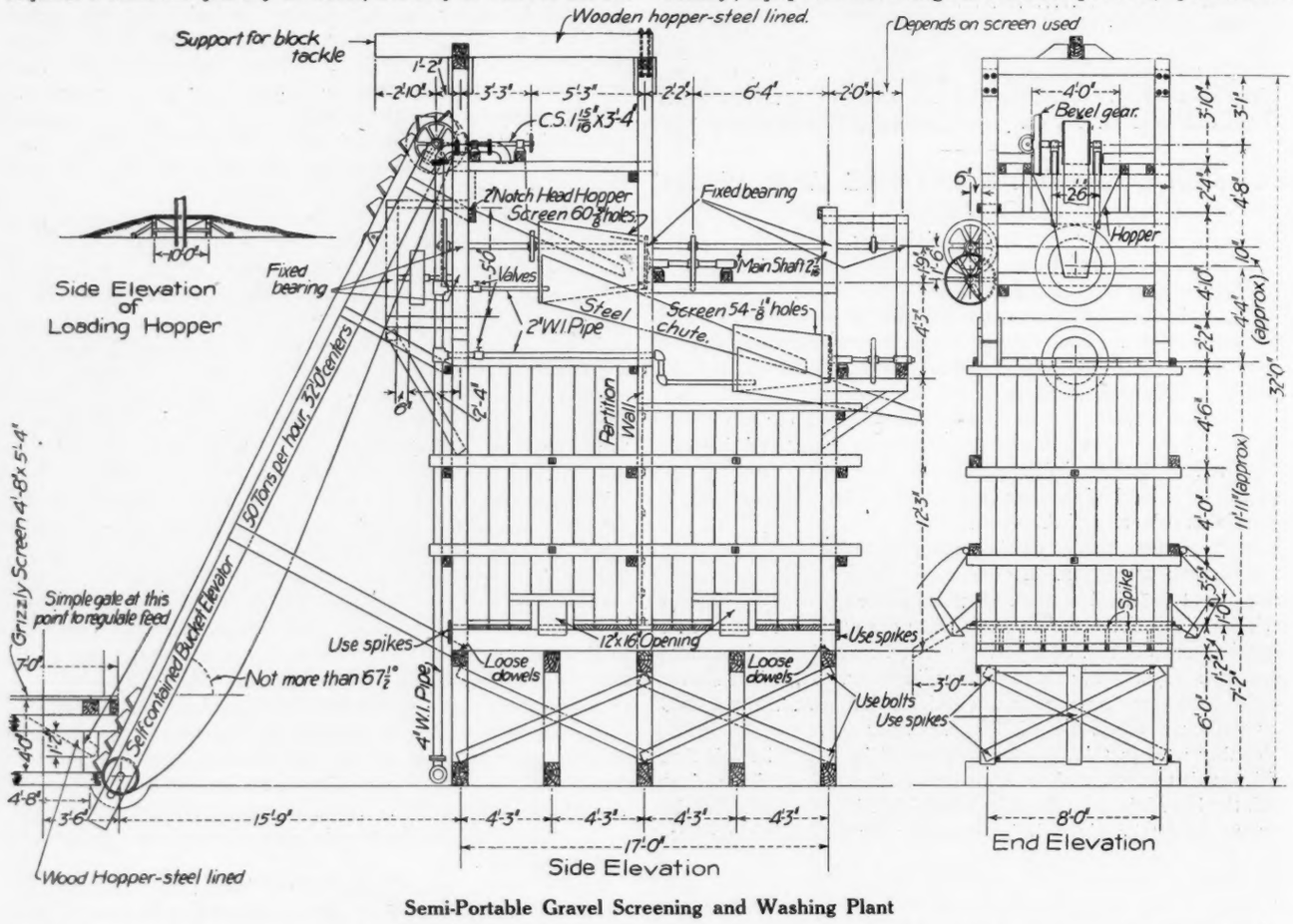
duces the coarse aggregate ranging from ¼ to 1½ in. When specifications refer to material retained on a ¼-in. screen, the screen meant is a testing screen, which is simply ¼-in. wire mesh stretched over a circular frame of small diameter. Testing screens of this type are held in a horizontal position when the material is screened through them, the screens being shaken by hand sufficiently to force all material under ¼ in. through the openings. Hence, the perforations or openings in screens used in washing or screening plants must be of such diameter as experience and experiment have proved will produce materials conforming to the hand-screen test. It will readily be appreciated that sand and fine aggregate can be made to pass over instead of through a ½-in. mesh screen if the angle at which it is set and the speed of travel are made great enough.

The successful operation of a sand and gravel washing plant requires a sufficient quantity of water, not only to remove the silt from the material, but also to assist in sizing it. Every screen should be supplied with a separate water-supply spray, which also serves to rinse the material as it leaves the screen. The quantity of water required to thoroughly wash and size sand and gravel varies from ½ gal. to 1 gal. per minute, per cubic yard of material prepared per day. That is, if the capacity of the plant is 500 yd. of prepared material per day, from 250 to 500 gal. of water per minute will be necessary at the pump. This apparent wide range in figures is due to variations in the sand and gravel that will have to be handled. In determining pump capacity it is necessary to know, of course, the quantity of water required, length of pipe between the pump and the point of discharge, size of pipe, total distance from the surface of the water at the suction end to the point where water is discharged, and the pressure of water desired at the point of discharge. In many gravel pits, large stones or boulders are found that cannot be used in concrete without crushing. Material which is over size and rejected by the first screen should be passed to a spout which will convey the large size stones to a crusher.

If materials are not used as coming from the washing plant, then storage facilities must be provided. Bins can be made of timber, steel or concrete, but if they are to be portable or semi-portable they should be constructed of timber or steel, preferably timber, as such bins can be moved around readily on trucks. Stationary bins are usually constructed only for permanent plants having large capacity.

The horse power required to operate this plant will vary considerably, depending upon modifications of design and capacity. Gasoline motive power is very convenient, economical and adaptable.

The particular advantages of the plant shown in this design are that preparation of sand and gravel for use in concrete, or by slight modifications, the preparation of ballast that in its natural state is unsuited for use, may be accomplished very readily; equipment and design are not complicated; specifications covering coarse and fine aggregate, as regards sizing and cleanliness, are easily met; such a plant can readily be made to produce coarse aggregate grading from ¼ to 1½ in. that will contain not to exceed 5 per cent of material passing through a ¼-in. hand-testing sieve, nor containing more than 3 per cent of silt; aggregate graded from ¼ to ½ in. can be produced so that not more than 10 per cent will pass through a ¼in. hand-testing sieve.



Semi-Portable Gravel Screening and Washing Plant

RAILWAY CONSTRUCTION IN JAPAN.—A recent consular report says that the Japanese Government has laid down a general policy for railway construction. If the plan be adopted, the country's railway webs will be completed within ten years, with the addition of 1,219 miles to the mileage already operated. During the present fiscal year new lines of 79 miles will be completed and opened to traffic. Within the succeeding six years 238 miles will be completed, while the remainder is not yet assigned for the lack of capital. All the light railway lines, with a total length of 331 miles, are postponed until the year 1916-17, or later.

Practical Bridge Erection and Maintenance Methods

Second Series of Contest Papers Describing Solutions of Various Common and Special Problems by Bridge Men

The two prize winning papers and five other contributions received in the contest on Bridge Construction Methods, which closed March 10, were published in the *Railway Age Gazette* of May 21. The following contributions received at the same time cover other phases of interest to railway men engaged in building, maintaining and renewing bridges. Five additional articles for which space is not available in this issue will appear in an early maintenance section.

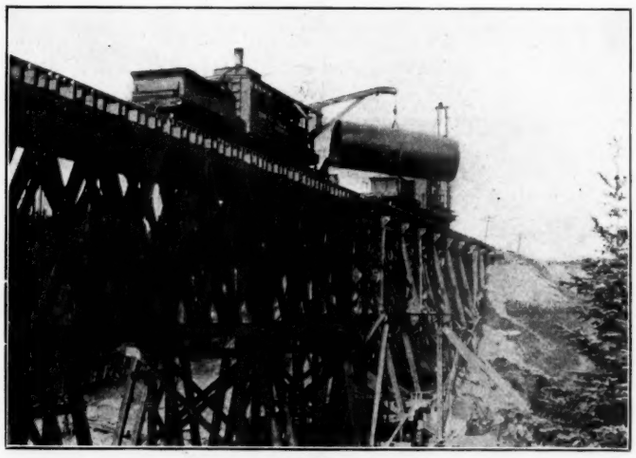
RECENT CYLINDER PIER CONSTRUCTION

By J. E. Bebb

Office Engineer, Duluth, South Shore & Atlantic, Duluth, Minn.

Metal cylinders, either of steel, wrought, or cast iron, have been used extensively by European engineers for piers and abutments of bridges, particularly by the British throughout the colonies of India, South Africa and Australia. American engineers, however, have been rather backward in adopting steel cylinders for this purpose, and until comparatively recent years they were used only under highway bridges or railroad structures of the lightest type. The following description covers two recent examples of cylinder pier construction on the Duluth, South Shore & Atlantic.

Bridge D-94, 9½ miles south of Houghton, Mich., on the Houghton Division, which was originally a pony Howe truss span 107 ft. long with a 50-ft. timber trestle approach at each end, was replaced by one 100-ft. through plate girder span and



Derrick Car Lowering 8-ft. Steel Cylinder for D. S. S. & A. Bridge over the Waiska River

two 50-ft. through plate girder spans, one at each end of the long span. The stream spanned is known as the Sturgeon river, which drains a large territory lying to the west and south of the right-of-way. The stream is approximately 130 ft. wide at this point and 17 ft. deep, and is subject to annual floods. Soundings showed that the bed of the stream consisted of 5 to 6 ft. of sand and silt overlying red clay. Embedded in the silt were found logs and driftwood in large quantities. This fact made it seem probable that the driving of sheet pile cofferdams would be attended by considerable difficulty, so that the construction of piers by this method was abandoned as uneconomical. It was finally decided to use two 5½-ft. steel cylinders 26 ft. long filled with concrete, for each pier with a supporting cluster of 7 piles driven inside each cylinder. The cylinders were made of ⅜-in. steel plates, with lap joints and rivets spaced 4 in. vertically and horizontally. Each pair of cylinders was joined at the top by 8-ft. girder diaphragms.

The bottom of the stream at each pier location was thoroughly dragged to remove all logs and driftwood. Excavation was begun with a 1¼-yd. orange peel bucket operated from a boom derrick on the shore before the cylinder was placed in position. About one-half of the total depth was excavated in this manner. The tube was then lifted by the derrick and placed in position, the remainder of the excavation being handled by means of a ½-yd. orange peel bucket operating inside the tube. All of the cylinders settled quite uniformly under their own weight or by blocking between the cylinders and the stringers of the old bridge, after the latter had been raised by jacks, and then allowing the weight of a locomotive to force the tubes downward. Slight inequality in settling was corrected by swinging a stick of timber in the falls of the derrick and using this timber as a ram or hammer along the edge of the tube. No obstacle in the form of logs or boulders was encountered during the placing of the first three cylinders. When the fourth cylinder was within 2 ft. of grade, a large log was struck lying diagonally across the cylinder's location 13 ft. below water level. Attempts to remove the log by grappling hooks and dynamite proved of no avail. A large chisel was then made by forging and sharpening the end of an 80-lb. rail. This rail was suspended between the leads of a track pile driver and a section cut from the log by striking the rail with the hammer.

When all the tubes were down to grade and thoroughly cleaned out, seven 40-ft. piles were driven in each one and cut off just above the water line. The water was then pumped from the tubes and the interior filled with concrete. In only one instance was it necessary to deposit a seal of concrete in the bottom of the cylinder before pumping out. The concrete filling was carried to within 14 in. of the top of the tubes and levelled. Four bolts, 1¼ in. in diameter and 15 in. long, were set in the concrete, 6 in. of the bolt protruding above the surface of the concrete. The upper ends of these bolts had been threaded and provided with nuts. Circular concrete cap slabs had been cast with an I-beam grillage in each slab for the girder bearings, before the work on the bridge began. These caps were placed in position on the four bolts by the derrick. The exact elevation of each cap slab was obtained by adjusting the nuts on the four bolts that supported each slab. Two pieces of 3-in. iron pipe had been cast into each slab extending from top to bottom, and through these two openings cement mortar was forced, after the slab had been set to line and grade. This mortar filled the 6-in. space between the concrete deposited in the cylinder and the under side of the slab, also the small annular space between the sides of the cylinder and the slab.

The usual concrete abutments were then built at the ends of the bridge, the girders placed in position and the bridge completed. The bridge was built in mid-winter, concrete being placed when the temperature was as low as 10 deg. below zero. The water and concrete aggregates were heated and the interior of the cylinders kept warm by steam coils.

Bridge No. 6, 12 miles west of Sault Ste. Marie, Mich., on the main line to Marquette, was originally a timber frame trestle, with a deck Howe truss 129 ft. long on pile piers spanning the stream. The total length of the bridge was 452 ft., and the height above normal water 49 ft. This bridge was replaced by a steel trestle 436 ft. long, with a 104 ft. 6 in. girder over the stream. The tower spans are 31 ft. long. The two towers on each side of the stream rest on concrete-filled steel cylinder piers. The remaining towers rest on concrete piers of the usual type. The stream is known as the Waiska river, and is 155 ft. wide and 17 ft. deep at the crossing.

Soundings showed that the bed of the stream was composed of

stiff red clay to a great depth. Large quantities of logs and driftwood were found on the bottom. The cylinders were made 8 ft. in diameter, and were built of ⅜-in. steel plates. This enabled a 1¼-yd. orange peel bucket to work inside the cylinder, which hastened the sinking. The toughness of the clay rendered the excavation more difficult than in the case of the Sturgeon river bridge. Also the friction along the sides of the cylinders was great enough to prevent their sinking, as the interior was excavated. A frame of heavy maple timber was made and placed on top of the cylinder. An old pile driver hammer was fastened to the falls of a small boom derrick and used to drive the cylinders by striking the timber frame. A hand line fastened to the hammer made it possible to place the blows on various parts of the frame, which kept the cylinder plumb and the settlement uniform.

Seven piles were driven in each cylinder, which was then pumped out without sealing the bottom with concrete. Leveling bolts with sleeve nuts were set in the top of the concrete. An I-beam grillage was used on each cylinder instead of the concrete cap. This grillage was brought to proper level by the leveling bolts and to proper line by shifting the grillage on the bolts. The grillage was then concreted in to form a cap for the pier.

The cylinders were handled and placed by a steam derrick working on the deck of the old bridge. This derrick also handled the concrete mixer. When each cylinder was ready for concrete, the mixer was placed by the derrick upon a staging directly over the cylinder and the concrete discharged into the interior without handling. The same method was used in placing the concrete in the piers under the towers on the shore. The boom derrick and hoisting engine which operated the orange peel bucket were handled by the derrick and moved from place to place as necessary.

This steam derrick was built from an old steam shovel which had been badly damaged by rolling down a steep embankment and was not considered worth repairing for shovel work. The work of remodeling was done by the motive power department. Its present lifting capacity is 20 tons. It is self propelling and is used on bridge work in place of a work train.

To utilize the second class timber released from bridges recently rebuilt, a small portable saw-mill has been purchased and set up at Marquette in the building which houses the rail saw. During the winter months when the rail saw is not much used, the electric power is utilized to saw this timber into smaller sizes for building purposes. Practically all of the rough building lumber used for the past two years in building construction has been resawed from used bridge timber.

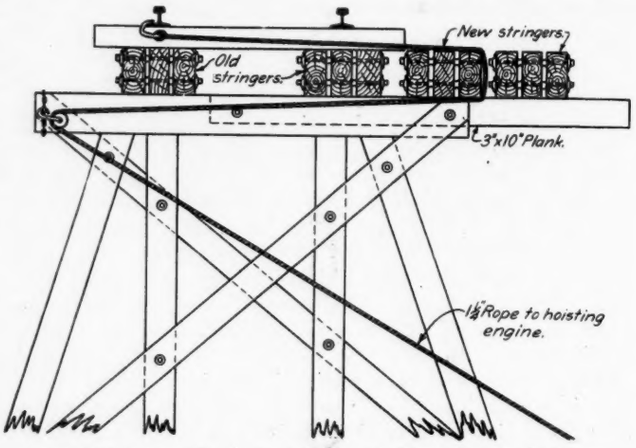
RENEWING TRESTLE STRINGERS WITHOUT DELAY TO TRAFFIC

By S. C. Tanner

Master Carpenter, Baltimore & Ohio, Baltimore, Md.

In renewing the stringers in the trestle approach to the Baltimore & Ohio coal pier at Curtis Bay, Md., it was essential that the work be handled without delay to the trains of coal which pass over this trestle to the pier every 10 or 15 min., day and night. Any interference to these trains would have meant considerable delay in the yard operation and to the traffic on the road, as well as inconvenience in the loading of ocean liners.

A scaffold was built along one side of the trestle by bolting 3-in. by 10-in. planks to the caps and the new stringers were hoisted to this scaffold by the derrick shown in the accompanying illustration. The ties were then turned with the framed side up in order to make a smooth surface over the tops of the stringers, after which the track was spiked to the ties and the ties spiked to the stringers on the side opposite the scaffold. By jacking up the track on the side adjacent to the scaffold the new stringers on the scaffold were pulled under the ties between trains. A 1¼-in. rope run from a hoisting engine on the ground through a snatch block at the opposite end of the cap, around the new stringers and back to the opposite rail, was used for pulling in the stringers, the old ones being pushed ahead until they touched the stringers on the opposite side. The second new set was then pulled under in the same way until they touched the first set, making a solid tier of timbers under the ties. After removing the spikes from the old stringers on the opposite side and jacking up the track on that side, the first set of old stringers was pulled out to the ends of the caps and the other set of old stringers and the first set of new ones pulled over to replace them. This allowed the second set of new ones to be pulled into the permanent location. The bolts were then removed from



Sketch Showing Method of Pulling in New Trestle Stringers Without Weakening the Structure

the first line of old stringers and the timbers dropped to the ground, after which the second set of old stringers was pulled out to the end of the cap and the first set of new stringers pulled into its permanent location. Any parts of the old stringers that were worth saving were snubbed down to the ground with a rope to prevent their being damaged.

This method insured safety, as the new stringers took some of

Hoisting New Stringers to Scaffold Alongside Trestle

the load from the old ones and had a tendency to make the structure stronger rather than weaker during the renewal. The ties were turned back with the framed side down, and the work completed without the necessity for even reducing the speed of any train. A stretch of 580 ft. was renewed in this way at a cost less than would have been possible by any method I know of.

PLACING THROUGH GIRDER SPANS BY LATERAL MOVEMENT

By E. W. FAIR

Supervisor Bridges and Buildings, Buffalo, Rochester & Pittsburgh, Du Bois, Pa.

The Buffalo, Rochester & Pittsburgh has replaced a number of steel bridges in the past three or four years by assembling the new structure on falsework alongside the old and pulling it laterally into place, using heavy bridge dollies bolted to the ends of the girders in place of the bridge shoes. This method of supporting the new spans is objectionable, however, on account of the delay involved in jacking up the bridge and removing the dollies after the new structure has been put in place before traffic can be carried over it. For this reason a method has been developed by which the span is moved on rollers between two sets of rails. In this case it is only necessary to block the rollers to allow traffic to pass over the new structure, the permanent shoes being placed later.

In the case of bridge No. 202.01, the old structure was a double-track through plate girder span 62 ft. 6 in. long, with a middle girder between tracks and a spacing of 31 ft. 2 in. center to center between outside girders. This bridge was replaced by a through girder span of the same length without a middle girder, carrying a solid concrete floor. On account of the dense traffic the new span was assembled and riveted up on falsework west of the old track, the concrete floor, ballast and ties being put in place on the new bridge. As it was necessary to cut down the masonry abutments and place new concrete bridge seats, pile bents were driven to support the old span and these were capped at an elevation low enough to allow jacks to be placed on them after the new span had been rolled into place to remove the rails and place the shoes.

Three 100-lb. rails were placed on the falsework under the new span at each end close together with the ball of the rail up, and extending over the new bridge seats. The new span was assembled on two 100-lb. rails with the ball of the rail down, these rails being fastened together with bolts extending through joint holes with wooden filler blocks to keep them from turning. Steel rollers 2 in. in diameter were laid between the two sets of rails at 18-in. intervals and were also placed in position on the lower rails ahead of the new structure ready to receive it in rolling into place. The end floor beams were in line with the sole plates, providing a support for the two rails carrying the new span. The center rails on the bridge seat were extended out over falsework on the east side erected to receive the old span when moved out to make room for the new.

Two wrecking cranes were used to make the movement, the cars being placed as close as possible to the ends of the bridge. The old span was raised and girder dollies placed under each corner, after which it was pulled out on the falsework at the east side and the new span pulled in from the west. This change was made between 6:10 a. m. and 7:25 a. m., the actual time of pulling the new structure into line being only 8 min. The steel in this bridge weighed 315,220 lb., and the concrete deck 180,000 lb. In addition to this the span carried the limestone ballast and ties. A similar bridge 76 ft. 6 in. long in which the steel weighed 452,778 lb., and the concrete deck 225,000 lb. in addition to ballast and ties, was rolled into place on old 5-in. bridge pins, the track being out of service only 1 hour and 45 minutes.

No trouble was experienced in rolling these bridges into place and a probable saving in time of at least one or two hours was effected in addition to the greater convenience and security of this method. The difficulty experienced with the dollies was that they had a tendency to skew and bind on the flanges of the dollies, causing one or more of them to slide, which gave considerable trouble in moving heavy spans. With the free movement of the load on rollers it was found that by hitching the pulling lines near the center of the span the bridge could be moved evenly at both ends, although there might be a stronger pull on one line than on the other. The ease with which the heaviest of these two spans could be moved was demonstrated by placing a No. 6 Barrett track jack at each end and moving the span without difficulty with six men.

REPLACING HOWE TRUSS SPANS WITHOUT FALSEWORK

By J. B. SHELDON

Supervisor Bridges and Buildings, New York, New Haven & Hartford, Providence, R. I.

When it became necessary to renew the New York, New Haven & Hartford double-track bridge over the Blackstone river in Woonsocket, R. I., the two Howe truss spans of 146 ft. and 91 ft., respectively, were replaced by three deck plate girder spans, one of 91 ft. and two of 73 ft. The intermediate bearing for the girder spans replacing the long trusses was provided by a steel tower supported on a concrete pier built up a few feet above the water level.

The base of rail was about 47 ft. above the river and the water was about 11 ft. deep. In order to reduce the cost of falsework to the minimum consistent with safe operation of the bridge during construction, a number of changes were made in the old Howe trusses. The old trusses, which had been built in 1876, had been strengthened in 1890 by placing pile bents at each end under the second panel to reduce the chord strain. In order to permit raising the bridge seats at the ends of this span to receive the new girders the main braces at the ends of the old trusses were changed to incline away from the bridge seats and the bottom chord was cut in front of the bridge seats, making cantilever spans at the ends of the old trusses, the temporary pile supports serving as

Renewing a Howe Truss with Two Girder Spans. The New Span on the Right Is in Place, the Other Is Supported from Overhead Bents During the Removal of the Old Floor System

abutments. Also to permit the erection of the tower on the new center pier to support the new girder span the bottom chords of the trusses had to be cut and to carry the load mud sills were placed on each side of the new pier foundation and frame bents erected, after which the counter braces for two panels at each side of the center of the trusses were reinforced to act as the main braces of the two spans which were formed by the cutting of the bottom chord. The top chords of the old trusses were not cut until after the girders had been placed and the old trusses removed.

The new girder spans were riveted up on a nearby siding and taken to the bridge on flat cars. When spotted above their permanent location they were raised from the cars by manila rope lines and tackle blocks hung from overhead timber bents, supported from the piers below. The lead lines to these hoisting blocks were handled by a locomotive at each end of the structure, the lines being long enough to allow the flat cars to be pulled out one at each end, and to stand on the structure between the girders and the locomotive. With the new span held by the locomotives the floor system of the old bridge was dropped into the river and the girder spans were then lowered into position between the outside and the middle trusses of the old bridge. These girders were placed on three successive Sundays when traffic over the line was the lightest. About 20 trains were operated over a single track during the 10 hours that the one track was blocked, while removing the floor of the old bridge and placing the new girder span. The cost of temporary falsework for carrying traffic was thus avoided. The cost of all work in connection with installing the new steel, riveting the girders, towers, etc., was $7.20 a ton. The work was handled by the company's maintenance forces under the direction of the writer.

RENEWING A BUSY MAIN LINE BRIDGE ON THE SANTA FE

By L. C. Lawton

Division Engineer, Atchison, Topeka & Santa Fe, Newton, Kan.

During the latter part of 1914 the three-span deck girder bridge carrying a double track over the Cottonwood river at Florence, Kan., was replaced by a four-track through girder structure of the same span length in order to provide additional waterway without a raise in grade, and additional tracks to carry a heavy main line traffic and numerous yard movements. This bridge is located between the east and west yards of an important freight junction, the new tracks forming a part of a new yard plan which will be the beginning of a four-track system. This is a coal and water station for all freight trains and the new arrangement will permit two or three trains to come into the yards from either direction and take coal and water without blocking the main line. These tracks will also serve as switching leads to both yards.

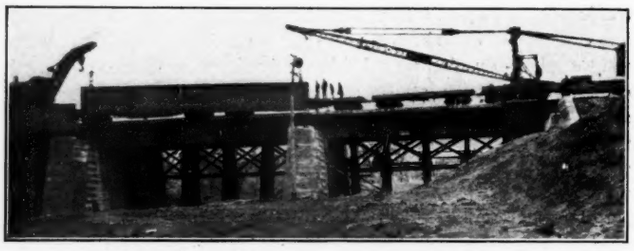
As in most trunk line work, it was necessary that traffic should not be interfered with, and to prevent it, falsework for one track on the north side was driven. This was located so as to carry one of the new tracks and crossovers were so arranged that any two of the three tracks could be used as part of the double-track main line. All falsework was built to carry any train under ordinary control in yard limits.

The old masonry was of local limestone in large blocks, well cut and pointed, and with the exception of the west abutment and several pedestal blocks was in very good shape. The east abutment, however, had been built on the fill, and had to be taken out and a concrete gravity abutment placed on solid rock 37 ft. below the base of rail. To carry the ends of the girders while this was being done, a double bent was driven to clear the toe of the new abutment, and to carry the track over the excavation falsework was driven back of the abutment and was connected to the girders by boxing in a frame bent between the ends of the girders to carry the stringers from the last bent. The same method was used on the west abutment, as the entire top had to be removed.

On account of the change in depth of girders, the old masonry had to be raised several feet. This, together with the fact that the old piers were much thinner than the present standard requires, made necessary the adding of a jacket of concrete 2 ft. thick on each side of the piers. Holes 36 in. apart in horizontal rows, 18 in. apart vertically and 12 in. deep, were drilled in both sides of the old piers and hooks made of reinforcing bars were placed in these holes, wedged with track spikes, and later grouted. To these hooks were fastened a network of ⅝-in. bars spaced 36 in. horizontally and 18 in. vertically at a distance of 4 in. from the forms. This frame work was so well set that it was used as a ladder by the carpenters in completing the forms. These bars were carried around the ends of the old masonry into concrete extensions and above it, where the pedestal blocks and coping had been removed, into a solid cap 5 ft. thick. The concrete under the girder shoes was reinforced in the usual way.

On the south side a temporary material track was built up to the west end of the bridge, with its end elevated on frame bent so that rock and sand for concrete could be unloaded from dump cars. A cement shed was also built adjacent to it, of old roundhouse doors framed so as to be easily put up, taken down and transported. A light roof of tar paper on sheeting went with it. A floor of old boiler plate was placed for stone under the end of the material track, which made the shoveling much easier and quicker. A cantilever runway was built along this side of the bridge for handling all material on barrows from this end to the mixer set up over the forms on bents. Both piers and the abutment were built up for the full length as high as concrete could be run under the girders from this side.

While this was being done, material for the falsework first mentioned was received and placed, after which the north



Placing 70-ft. Through Girder with Wrecking Crane and Derrick Car

ends of the piers and abutments were completed by using this for a runway. It was not practical to spout or wheel concrete across the tracks, nor could material be unloaded except at one end of the bridge. This made a long barrow haul for part of the material, but the relatively small amount of the work, 3,300 cu. yd., did not justify a more expensive outfit. The labor cost of unloading, mixing, and placing concrete was $1.08 per yard. This included the piping of water and steam, building of runways and scaffolds, moving mixer and unloading all material, but not the building of forms or placing reinforcement, other than that laid during pouring of concrete. The labor on forms was $0.52 per yard of concrete, which was rather high on account of their enclosing much old masonry.

There are three new girders in each span. To make room for the center one, the south track had to be thrown 22 in. This was done by moving the deck girders onto new frame pedestals by lifting and pushing with heavy jacks and by lining the falsework and track with them. This allowed the bridge seat in the center to be completed, its top being nearly 2 ft. above the bottom of the old girders. The remainder of the top course of the piers and abutments was not finished until the old girders had been taken out.

On account of the narrow space in which to work, only one mixer could be used. The work was laid out so as to keep this working as much as possible, by keeping the excavating out of the way of the forms, and the latter well ahead of the concrete. It was necessary to move the mixer oftener in this way, so as to allow time for building forms after the foundation had been poured, as it was found that by getting the forms nearly completed and well braced from top to bottom before pouring, a big saving in form work could be effected.

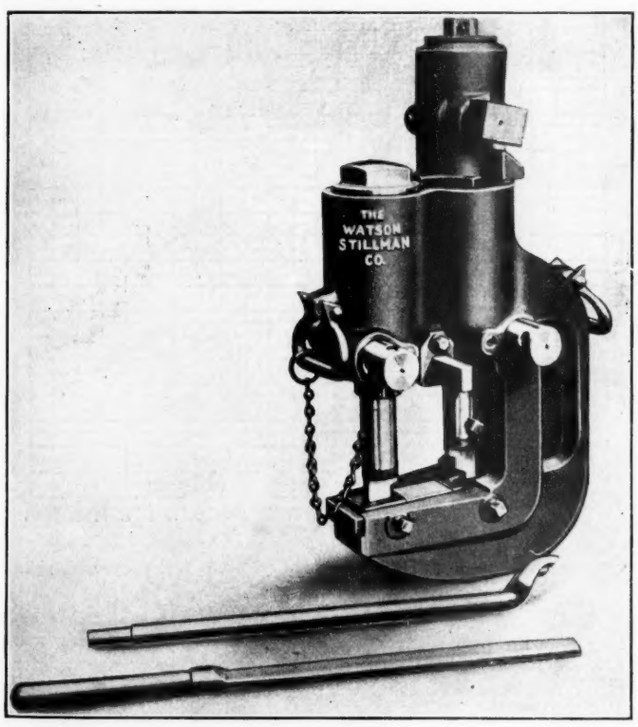
All concreting was completed well before freezing weather except that part placed under the center girder after the old

bridge was shifted. As this had to hold up the major portion of the bridge, it was especially important that it should not be frozen and that it should be well cured. This work was done during a very cold spell in December, as it could not be held up, on account of the schedule of the steel gang. The concrete was mixed with hot water and was still warm when placed in the form. Over this section in each abutment and pier was erected a shelter of canvas, and two oil stoves were placed in each. These were kept going for three weeks on account of the unusually cold weather for that month. The heat was not great enough to dry out the concrete—in fact, it was kept damp by melting snow on the bridge and canvas, but it did let it set under very favorable conditions, and proved to be as hard as any when points for shoes were set.

The steel was placed by company force, which has been found much cheaper than by contracting it. All work was done by a large derrick car with a capacity of 45 tons, except the placing of the new girders, where the division wrecking crane took one end and the derrick the other. A creosoted floor for ballast deck was placed after the laying of the floor beams, and the track put in service on the south bridge while the floor was being put in on the north side.

A NEW DUPLEX SPIKE SLOT HYDRAULIC PUNCH

The Watson-Stillman Co., Aldene, N. J., has brought out a new hydraulic punch for cutting out two spike slots in railroad or conductor rails at one setting. The advantages of this tool are that two holes can be punched on opposite sides of the rail at one operation in exact alinement, thus saving in the time usually consumed in laying out centers and changing the machine from one side of the rail to the other.



Duplex Spike Slot Punch

By referring to the illustration it will be seen that one punch is attached to a chain. To use the machine this punch is removed, the tool is then placed against the rail and the loose punch replaced in position. The punches are then run down to the rail by pinions which mesh into racks on the rams, and a few strokes of the pump lever completes the operation, the return being effected by means of the racks and pinions. The whole action takes only two minutes and requires but a small amount of effort.

The punch is built compactly and is designed to give maximum strength for minimum weight, so that it may be easily and quickly handled when time is a factor. The working parts are readily accessible for cleaning and the punches and dies are removable for sharpening, renewal, etc.

THE ROADMASTERS' CONVENTION

The thirty-third annual convention of the Roadmasters' and Maintenance of Way Association will be held at the Auditorium Hotel, Chicago, from September 7-10 inclusive. From the interest already shown, this meeting should be one of the largest attended in the history of this association. In addition to individual papers, several committee reports will be presented, including those on new and experimental track accessories and tools, and on the proper organization of section forces and methods for handling and policing track (1) for high-speed, heavy traffic railroads; (2) for lightly constructed railroads carrying heavy traffic; (3) for large terminals.

The program in detail is as follows:

Tuesday, September 7, Morning—Convention called to order at 10 a. m.

Afternoon—2 p. m. to 6 p. m. Business session. Reading of committee reports and general discussion.

Evening—7:30 to 10 p. m. Business session. Reading of committee reports and general discussion.

Wednesday Morning—9 a. m. to noon. Business session. Reading of committee reports and general discussion.

Afternoon—12:45 p. m. Members will leave the Chicago & North Western Terminal on a special train at 1 p. m. to inspect various terminals, including the new clearing yard.

Thursday Morning—9 a. m. to noon. Business session. Reading of committee reports and general discussion.

Afternoon—1:30 p. m. to 6 p. m. Business session. Election of officers. Selection of the next convention city.

Evening—A theatre party for the ladies will be given by the Track Supply Association. The fourth annual banquet will be given by the Track Supply Association for the members and guests of the Roadmasters' and Maintenance of Way Association at the Auditorium Hotel.

Friday Morning—9 a. m to noon. Business session. Reading of committee reports and general discussion.

Afternoon—1:30 p. m. to 6 p. m. Business session. Reading of committee reports and general discussion.

Equally promising is the outlook for the exhibit of the Track Supply Association. Up to August 12, 59 firms had made reservations for space as compared with a total of 51 last year, which exhibit was the largest up to that time. As in the past the exhibits will be confined exclusively to tools and appliances for the track department and will consist almost entirely of full sized units rather than models. In addition to the regular track accessories ordinarily found, such as rail anchors, guard rail clamps, tie plates, splices, switchstands, etc., there will be other exhibits such as acetylene lights, motor cars, track tools, etc. As in previous years the exhibit will be located on the top floor of the Auditorium Hotel, adjacent to the convention hall.

The following firms will exhibit:

Acme Supply Company.
American Flexible Bolt Company.
American Guard Rail Fastener Company.
American Hoist & Derrick Company.
American Steel & Wire Company.
American Valve & Meter Company.
The Anchor Company.
Ajax Forge Company.
T. B. Bowman.
Carnegie Steel Company.
Commercial Acetylene Railway Light & Signal Company.
Composite Tie Plate Corporation.
Bruce V. Crandall.
Creep Check Company.
Crerar Adams Company.
Dalton Risley & Associates.
Daniels Safety Device Company.
The Duff Manufacturing Company.
The Efficiency Rail Anchor.
Elliot Frog & Switch Company.
Fairbanks, Morse & Co.
Fairmont Machine Company.
Franco Manufacturing Company.

Exhibitors at Roadmasters' Convention (Continued.)

Frictionless Rail.
Hatfield Rail Joint Company.
Hayes Track Appliance Company.
Harry C. Holloway.
Hubbard & Company.
Indianapolis Frog & Switch Co.
Ingersoll-Rand Company.
Kelly-Derby Company.
Keystone Grinder Manufacturing Company.
Lackawanna Steel Company.
Madden Company.
Berton W. Mudge & Co.
M. W. Supply Company.
National Lock Washer Company.
National Malleable Castings Company.
Northwestern Motor Company.
P. & M. Company.
Pennsylvania Steel Company.
Pocket List of Railroad Officials.
Positive Rail Anchor Company.
Q. & C. Company.
The Rail Joint Company.
Railroad Supply Company.
Railway Age Gazette.
Railway Equipment & Publication Company.
Ramapo Iron Works.
Reading Specialties Company.
Sellers Manufacturing Company.
Stanford, Arthur L.
Templeton-Kenly Company.
Track Specialties Company.
Union Switch & Signal Company.
U. S. Bolt Company.
Verona Tool Works.
William Wharton, Jr., & Co., Inc.

THE ANNUAL COST OF TIES

By J. G. Sullivan
Chief Engineer, Canadian Pacific, Winnipeg

Formula (2), submitted by the Tie committee of the American Railway Engineering Association last March, gives the annual cost to maintain a tie as follows:

$$I + A = \frac{CR\ (1 + R)^n}{(1 + R)^n - 1}$$

Where C = First cost of tie in place.

A = Amount at compound interest which will provide for renewal at the end of the life of the tie.

R = Rate of interest.

N = Life of tie in years.

I = Interest on the first cost.

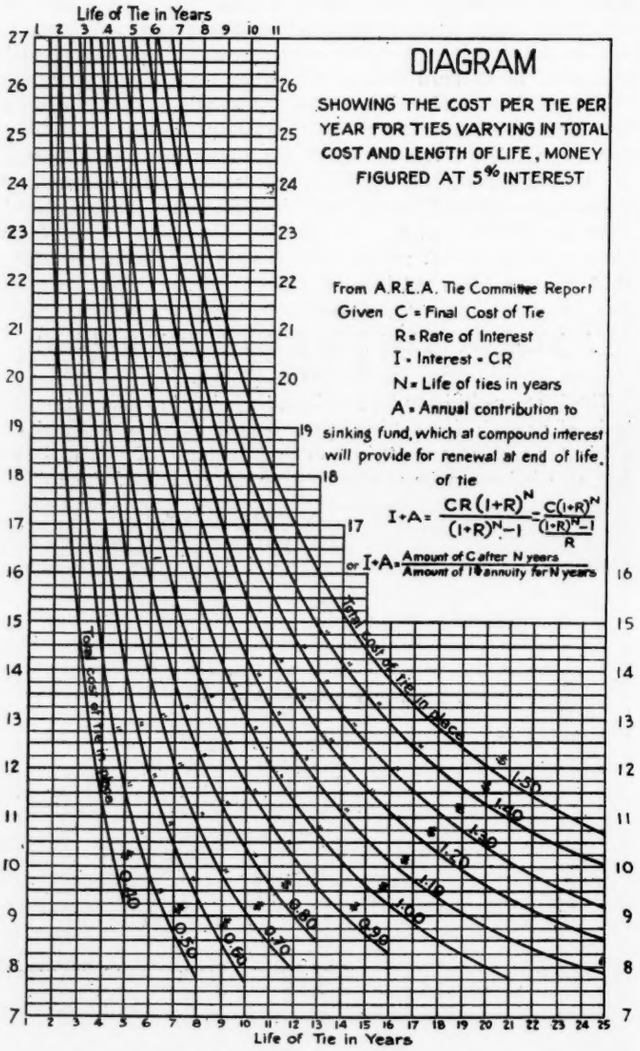
While this formula appears somewhat complicated, it is not so formidable if it is divided up into factors which can be taken from compound interest tables.

For the use of our tie department and engineers, I have had three diagrams made up, showing the value of I plus A, from which the annual cost per tie can be taken for ties costing from $0.40 to $1.50, and varying in life from 2 to 25 years. These diagrams would be much easier to use if they showed only the value of "A"; that is, the amount required to be subscribed annually to form a sinking fund which would purchase a tie. To this would be added direct the interest on the first cost of the tie. This would have a slight advantage over the present form in a case where the cost of the present tie will differ from the estimated cost of the new tie. The same result, however, can be obtained by taking from the diagram the annual cost, using the estimated value of the new tie, deducting from this the interest per annum at the given rate on this difference. For example, if we estimate that it will cost $0.80 to renew a tie which cost $0.75 in place, and will last 8 years, money figured at 5 per cent, we take from the diagram the annual cost of an $0.80 tie lasting 8 years, which is $0.124 and deduct from this the interest at 5 per cent on the difference in the actual cost and the estimated cost of the renewal, 5 cents, which is $0.25, making the annual cost $0.1215 instead of $0.124.

ANNUAL COST OF TIES
LASTING VARIOUS LENGTHS OF TIME, COSTING IN PLACE VARIOUS SUMS
MONEY FIGURED AT 5% INTEREST

LIFE IN YEARS	COST IN PLACE												
	$0.40	$0.50	$0.60	$0.70	$0.80	$0.90	$1.00	$1.10	$1.20	$1.30	$1.40	$1.50
1	0.420	0.525	0.630									
2	0.215	0.269	0.322	0.376	0.430	0.484	0.538					
3	0.147	0.184	0.221	0.257	0.294	0.331	0.368	0.405	0.442			
4	0.113	0.141	0.169	0.198	0.226	0.254	0.282	0.310	0.338	0.367	0.396	0.423
5	0.092	0.115	0.139	0.162	0.185	0.208	0.230	0.254	0.278	0.301	0.324	0.345
6		0.098	0.118	0.138	0.157	0.177	0.196	0.216	0.236	0.256	0.276	0.294
7		0.086	0.104	0.121	0.138	0.155	0.172	0.190	0.208	0.225	0.242	0.258
8		0.078	0.093	0.109	0.124	0.139	0.156	0.171	0.186	0.202	0.218	0.234
9			0.084	0.098	0.112	0.126	0.141	0.155	0.168	0.182	0.196	0.210
10			0.077	0.091	0.104	0.117	0.129	0.142	0.154	0.168	0.182	0.195
11				0.084	0.096	0.108	0.120	0.132	0.144	0.156	0.168	0.180
12				0.079	0.090	0.102	0.113	0.124	0.136	0.147	0.158	0.169
13					0.085	0.096	0.107	0.117	0.128	0.138	0.149	0.160
14						0.090	0.101	0.111	0.121	0.131	0.141	0.151
15						0.087	0.096	0.106	0.116	0.125	0.135	0.144
16						0.083	0.092	0.101	0.111	0.120	0.129	0.138
17							0.089	0.098	0.107	0.115	0.124	0.133
18							0.086	0.094	0.103	0.111	0.120	0.129
19							0.083	0.091	0.099	0.108	0.116	0.124
20							0.080	0.088	0.096	0.105	0.112	0.120
21							0.078	0.086	0.094	0.101	0.109	0.117
22								0.084	0.091	0.099	0.106	0.114
23								0.082	0.089	0.096	0.104	0.111
24								0.080	0.087	0.094	0.102	0.109
25								0.078	0.085	0.092	0.100	0.107

The Annual Cost of Ties of Various Life and Original Cost


Life of Tie in Years
DIAGRAM
SHOWING THE COST PER TIE PER YEAR FOR TIES VARYING IN TOTAL COST AND LENGTH OF LIFE, MONEY FIGURED AT 5% INTEREST
From A.R.E.A. Tie Committee Report
Given C = Final Cost of Tie
R = Rate of Interest
I = Interest = CR
N = Life of ties in years
A = Annual contribution to sinking fund, which at compound interest will provide for renewal at end of life of tie
I+A = CR(1+R)^N / ((1+R)^N−1) = C(1+R)^N / ((1+R)^N−1) / R
or I+A = Amount of C after N years / Amount of 1 annuity for N years
Total cost of Tie in place
$0.40
$0.50
$0.60
$0.70
$0.80
$0.90
$1.00
$1.10
$1.20
$1.30
$1.40
$1.50
Life of Tie in Years

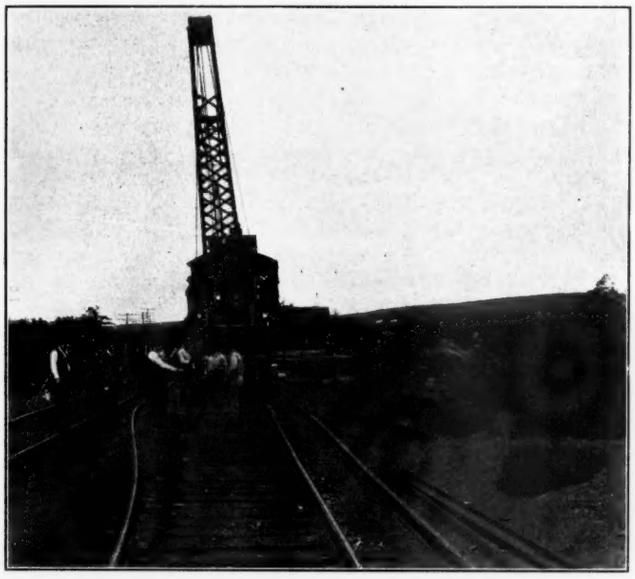
Curves Showing the Cost Per Tie Per Year for Varying Original Costs and Life

The Uganda Railway.—The new Port Bell-Kampala Railway in Uganda was opened for all classes of traffic on July 1.

Laying Rail with the Help of Locomotive Cranes

Lehigh Valley Finds That Laying Rail with Cranes Is More Economical and Interferes Less with Operation

The Lehigh Valley has been employing locomotive cranes experimentally when relaying rail to throw out the old rail and place the new, thereby doing away with the customary tong men. One of the early trials of this method was made on the Beaver



Heeling in a Rail on the Beaver Meadow Branch

Meadow branch in the anthracite coal territory on June 28. On this day 2½ track miles of 76-lb. and 80-lb. rail was replaced with 90-lb. rail in 14 hours actual working time, with one crane. A total of 832 33-ft. rails were laid in 840 minutes, the machine also throwing out the old rail as it moved forward.

Eighty-six men were employed on this work. Fourteen men

Throwing Out the Old Rail

pulled the spikes from the old rails in advance of the machine. It was necessary to pull both rows of spikes on the greater portion of the work and many rail braces had to be removed from the old rail. Six men assisted the machine in handling the rail, one operating the rail clamps, one man spiking each end of the rail in place, one man forcing the rail in against the row of old spikes with a bar, and one man on each end to guide the new rail in place. Two men cut the joints on the old rail at intervals of about 15 rail lengths. On curves, eight men adzed the ties on both sides of the rail and removed a large number of small tie plates. Twenty-five men spiked and gaged the new rail, 25 put on the splices and six men with picks and shovels moved the ties to enable these splices to be inserted.

The line was double tracked at this point and the rail gang was given the use of the eastbound track while the work was under way. The locomotive crane worked on a heavy descending grade with a maximum of 2.5 per cent. for 5,000 ft. This grade was for the most part on curves up to 13 deg. Under these severe conditions no trouble was experienced in operating the locomotive crane. An old locomotive tank was placed back of the crane to provide sufficient water, as there were no water stations in this vicinity.

As this was the first time that this gang had worked with a machine in this manner, some delay was experienced. Also, as the new rail had a considerably larger base than the old it was necessary to remove the old tie plates and to adze the ties before the new rail could be laid. About five rail lengths of old rail was thrown out at a time.

Based on this experience, a stretch of 4.7 track miles, including four switches, was relaid with 100-lb. rail and all the old material

Working on the Buffalo Division

loaded on cars on the Buffalo Division on July 15. Four locomotive cranes were employed for this work, one starting on each rail at the outer limits of the work and all working towards the center. The organization was similar to that described previously. A foreman, six laborers and a crane operator accompanied each crane, while other men followed the cranes, full bolting and spiking the new rail and uncoupling the old rail.

The first crane started work at 6:23 a. m., and the last crane at 7:45 a. m. The last crane completed work at 12:51 noon. The four cranes were employed 20 hours and 27 minutes, including 73 minutes total detention. In this interval 1,313 rails were laid, or an average of 64 per crane hour. The maximum average per crane hour was 76.5.

Following these cranes were air loaders picking up the old material. After the locomotive cranes had completed laying the rail they returned and assisted in this work, all material being loaded ready for shipment at 6:30 p. m.

Based on these results the Lehigh Valley now proposes to

adopt the standard practice of unloading all new rail with machines, laying it with locomotive cranes and picking up the old rail by machinery the same day. This will not only result in the work being done faster and more economically, but will reduce very materially the interference with operation.

This method has been devised under the general direction of G. L. Moore, engineer maintenance of way.

THE ITALIAN-ENGLISH COURSE OF THE PENNSYLVANIA RAILROAD

Of the 140,000 employees of the Pennsylvania Railroad east of Pittsburgh and Erie, over 11,000 are Italians. Practically all of these men have entered the service of the road in the last few years and their numbers are increasing steadily. They are found in nearly all branches of the service as is illustrated by the following census taken on the Manhattan Division:

Conductor	1	Stoker operator	1
Engineer	1	Laborers	344
Clerks	3	Stevedores	14
Foreman	1	Boiler cleaners	2
Assistant foremen	0	Coal trimmer	1
Stenographers	2	Sweeper	1
Telegraph operator	1	Assistant doorman	1
Signalman	1	Wiper	1
Painters	4	Repairmen	4
Riggers	16	Car builder	1
Watchmen	2	Wireman	1
Scalemen	4	Blacksmith helpers	2
Shop hand	1	Track walkers	5
Subdivision foremen	5	Crossing watchmen	73
Subdivision assistant foremen	11	Bridgemen	7
First laborers	4	Station laborer	1
Track watchmen	57	Car cleaners	15
Laborers	380		

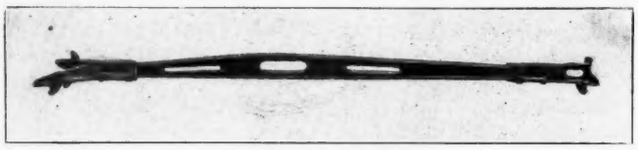
The greatest number are to be found in the maintenance of way department. This is illustrated more particularly by a similar census of 553 Italian workmen employed on the West Jersey & Seashore Railroad and the Camden Terminal Division.

CONVERSAZIONE

INGLESE	PRONUNZIA IMITATA	ITALIANO
Good-morning, foreman.	*Gud morning, formăn.*	Buon giorno, *foreman.*
What tools shall we use today?	*Guat tuls shall vuì ius tudēi?*	Che ferri useremo oggi?
Today we use the track jack.	*Tudēi vuì ius thi trăcc giăcc.*	Oggi usiamo il cavalletto delle rotaie.
What is the track jack?	*Guat ìs thi trăcc giăcc?*	Cosa è il cavalletto delle rotaie?
The track jack is a tool used to raise the track.	*Thi trăcc giăcc is ă tul iusd tu rēs thi trăcc.*	Il cavalletto delle rotaie è un arnese usato per alzare le rotaie.
How do you raise the track?	*Hau du iù rēs thi trăcc?*	Come alzate le rotaie?
Place the jack against the base of the rail.	*Plēs thi giăcc ăghĕnst thi bēs ov thi rēl.*	Collocate il cavalletto contro la base della rotaia.
Move the handle down.	*Muv thi handl daun.*	Muovete il manico giù.
On what side of the rail do you place the jack?	*On guat said ov thi rēl du iù plēs thi giăcc?*	Da quale lato della rotaia mettete il cavalletto?
On the outside of the rail.	*On thi autsaid ov thi rēl.*	Dal lato esteriore della rotaia.
Why do you place it on the outside?	*Guai du iù plēs ĭt on thi autsaid?*	Perchè lo mettete fuori della rotaia?
To prevent accidents.	*Tu privĕnt acsidĕnts.*	Per impedire degl'incidenti.
What accidents?	*Guat acsidĕnts?*	Quali incidenti?

A Typical Page of Conversational Lesson

A considerable number of these men are advancing from the ranks of laborers to positions of responsibility. A canvass several months ago showed that there were 75 Italian section foremen and 187 assistant foremen on the road. On the Pittsburgh Division 27 of the 53 track foremen and 42 of the 52 assistant foremen were Italians. Men of this nationality take to track work readily and many other efficient workmen would be promoted to assistant foremen and foremen if they were able to read and write the English language. To assist these men to acquire a knowledge of English, the railroad is preparing an Italian-English correspondence course for all who desire to avail themselves of



THE TRACK GAUGE
Fig. 4

Inglese

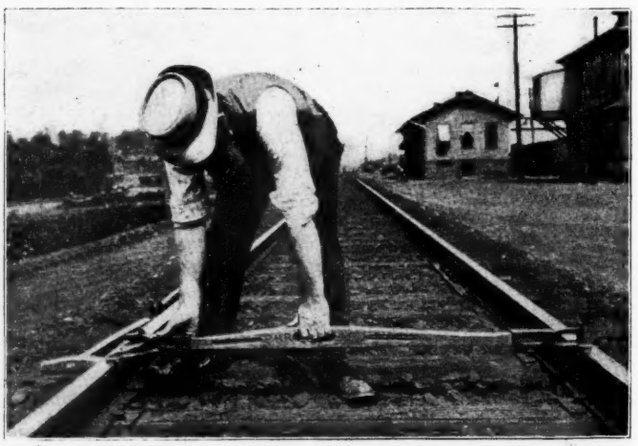
THE TRACK GAUGE

The track gauge shown in Fig. 4 is to ascertain the correct distance between rails. Its length is four feet eight and one-half inches. Anyone using it must take care to place it across the track, at right angles to the rail, as shown in Fig. 5. This shows how to use the gauge to determine the proper distance between rails. The end of the single point of the gauge is placed first on one of the rails and the forked end on the other. The two points of contact of the forked end of the gauge should each be against the rail.

Italiano

LA MISURA DELLE ROTAIE

***The track gauge* è la misura per ottenere la distanza esatta tra le rotaie. Essa è lunga quattro piedi e otto *inches* e mezza. Chi l'adopera deve aver molta cura a collocarla a traverso le rotaie, a guisa ad angolo retto con la rotaia, come è dimostrato nella Fig. 5. Questo dimostra come si usa la misura per determinare la dovuta distanza tra le rotaie. L'estremità della punta semplice della misura è posta prima su d'una delle rotaie, e poi l'estremità che termina a forca sull'altra. Ciascuna delle due punte di contatto della forca dovrebbe essere contro la rotaia.**



CORRECT WAY TO USE TRACK GAUGE
Fig. 5

A Typical Page Illustrating the Use of Track Tools

the opportunity of educating themselves in this regard, and over 2,000 men are already enrolled. This course is conducted by an Italian, the lessons being prepared with the co-operation of officers of the road experienced in the various subjects covered.

At the present time 12 pamphlets have been prepared. The first three give corresponding English and Italian words side by side and also short elementary sentences, including common track terms. The next five give descriptions and instructions regarding the use of the common tools, such as the jack, the gage and the ballast fork, with photographs showing the right and wrong ways of using them. Lesson 10 gives in detail the various signal rules.

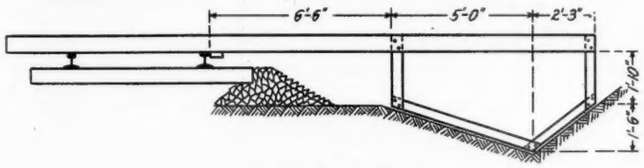
with illustrations, taken from the standard book of rules. Lesson 11 is devoted to the procedure of naturalization, while lesson 12 is a general discussion of the elementary rules for the preservation of the health. In these books the English and the Italian are placed side by side, so that the men can learn the corresponding terms to express the same idea. All illustrations and lessons refer directly to track work, incorporating the standards of the road.

DIGGING TRACK DITCHES

By Kenneth L. Van Auken.

Some track men do not take the trouble to do a first-class job of ditching, but leave the ditch with poor lines on the sides, an uneven bottom and various other irregularities which are not only unsightly, but greatly reduce the actual drainage afforded to the track. In most cases it is just as easy and cheap to do a good job. The whole problem is to organize the gang and to arrange the work so that no extra dirt is excavated and so that a correct line and bottom are assured. The foreman should take advantage of the ability of his best laborers to raise the standard of the entire work. In any gang there will be some men who are more conscientious than the rest, and who do much better work. The organization should be based, if possible, on a nucleus of such men with the idea that they will serve as guides to the others, and also as a measure by which the foreman can ascertain if the work is being done correctly.

Next to the correct placing of the men the efficient use of good tools and appliances is of the greatest importance. One of the most necessary implements for a ditching gang is a template to insure uniformity in the shape and gradient of the ditch. The template, or ditch gage, usually consists of a long plank or board to the end of which is attached a framework consisting of four strips, shaped to the standard ditch section. If available an old



A Simple Ditch Gage

spot board containing a level bubble may be utilized. When this template is placed across one or both of the rails in proper line and level, the gage will give the correct position of the ditch cross section. To insure correct line of the ditch a cleat or block may be nailed on the top strip of the gage at a point that will accurately center when this block is in bearing against the outside of the rail head.

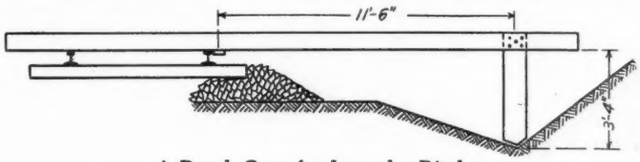
While the ditch gage is an excellent tool, it is not always possible to use it on roads where the cuts are not all of standard width. In many cases it is necessary to change the alinement of the back of the ditch to prevent digging into and loosening the slope, or it may be necessary to vary the distance between the front line of the ditch and the track, while it is sometimes required to change the slope of the sides or the shape of the ditch entirely. When the front of the ditch has to be changed the ditch line should be set so that there will be no abrupt turn.

Where the ditch gage described above cannot be used a modification of this tool is found very useful. This consists of a straight board or strip similar to that used with the ditch gage, to which a single board is nailed on the outer end in a perpendicular position, to indicate the depth of the bottom of the ditch below the top of rail. A thumb screw may be used to fasten the short piece to the top strip, and then the depth of the ditch may be gradually increased or decreased as desired, by raising or lowering the perpendicular strip by means of the adjusting thumb screw.

The regular ditch gage is usually made for the shallowest depth of ditch. When it is desired to make a ditch deeper than this, a rule is used to measure down below the bottom of the framework. Where the standard practice of the road requires the ditch to be widened as the depth increases, the increase in width should be obtained by moving the back ditch line further away from the track; the front ditch line should be kept straight and parallel with the track line if possible.

Ordinary No. 2 shovels are usually furnished for ditching. These can be used fairly well in loose material, but in hard clay special shovels or heavy bladed spades can be used to much greater advantage. One has only to note the kind of shovels used by the experienced excavators in large cities to realize what kind of a tool is best fitted for digging in hard material. These laborers, who follow excavating as a trade, will cut about three inches off the bottom of an ordinary No. 2 shovel, and cut the sides on a bevel to make the bottom about two inches narrower than the top. It is surprising how much dirt one of these excavators can handle with a shovel of this kind. They keep their shovels well sharpened, and use some sort of a metal plate on their shoes, which enables them to put more pressure on the shovel. The use of spades also results in a marked economy, provided the spades have backs of sufficient weight and strength. A cheap spade will be bent or broken a few minutes after it is placed on the job, particularly if it gets into the hands of an unskilled laborer.

It is much better to use some special kind of shovel or spade for excavating than to use ordinary No. 2 shovels supplemented by picks, in fact the use of picks should ordinarily be prohibited in ditching. A man will spend more time choosing between his shovel and pick than he does in actual work; and will frequently use the pick in material which is so soft that



A Depth Gage for Irregular Ditches

it is not needed, which means of course that he is wasting time.

The ditching gang on one division was organized somewhat as follows:—Two men were furnished a ditch gage like the one described and started out ahead of the gang, digging holes to the proper depth and line at intervals of about ten feet. Their work served to indicate the proper depth and slope of the sides of the ditch to the other laborers of the gang. The two best men in the gang were assigned to this work so that the foreman was sure that it would be done right. His supervision was thereby reduced to seeing that the rest of the laborers dug out the ditch between, in accordance with the holes excavated by the leaders.

This organization obviated the necessity for a gang of finishers and kept the laborers from digging out the dirt too deep. Two tie lines, one on each side of the ditch, insured good alinement. The traffic was quite heavy where this work was in progress and when it was impossible to have the loading train continuously on the work, the laborers were kept busy digging the ditch and piling the dirt on the shoulder. Then when the work train again came out the men were all used to load the material on cars. Although this involved handling the dirt twice it resulted in the most efficient use of the work train as the loose dirt could be loaded much quicker than it could have been taken directly from the ditch. Where the traffic is heavy the main problem is to get the greatest efficiency out of the work train. The foreman did not push the men on the work of digging out the ditch when the work train was away, but rather encouraged them to take it easy. Then when the train arrived the work of loading was pushed as rapidly as possible.

It is extremely difficult to do good ditching in a wet clay cut by hand—it may even require men on the cars to take the clay off the shovels. While there may be some question as to the use of a ditching machine in a dry cut where there is not much material to be moved, its use is surely advisable in wet cuts

where a large amount of excavation is required. At such a place the use of a ditcher will result in an immense saving, and in fact it is about the only way in which a real job of ditching can be done. It is almost impossible to keep a gang of laborers at all where the work becomes very disagreeable.

It is hardly necessary to state that ditching should always be started at the lower end of a cut, and yet one often sees this rule violated. If the ditch is begun at the upper end of the cut and there is a rain before the work is completed the water which cannot drain out will put the ground in such condition that it may be impossible to do any work for several days; while if the ditch is started from the lower end of the cut the water which finds its way to the ditch will have a ready outlet.

ABSTRACT OF ENGINEERING ARTICLES

The following articles of special interest to engineers and maintenance of way men, to which readers of this section may wish to refer, have appeared in the *Railway Age Gazette* since July 16, 1915:

New Lehigh Valley Pasenger and Freight Terminal at Buffalo.—The Lehigh Valley has started construction recently on a comprehensive terminal development at Buffalo. This work was described in an illustrated article in the issue of July 23, page 158.

The Metropolis Bridge Over the Ohio River.—The Chicago, Burlington & Quincy and the Nashville, Chattanooga & St. Louis have joined in the construction of a railroad extending from Metropolis, Ill., fifteen miles east to Paducah, Ky., including a bridge across the Ohio River. This structure is 5,442 feet in length, with a channel span 723 feet long. The general details were given in an illustrated article in the issue of July 23, page 160.

The Pennsylvania's 1915 Rail Specifications. — The Pennsylvania has been engaged for two years in the preparation of specifications for carbon steel rails and in the design of a new 125-lb. section, both of which embody several unusual features. These specifications and a diagram of the section were published in the issue of July 23, page 165.

The Engineer in Maintenance Work.—The relative opportunities offered to the engineer in construction and maintenance work were discussed editorially in the issue of July 30, page 183, the trend of the editorial being that greater opportunities for promotion and for continuous employment are presented in the maintenance of way department.

The Essential Qualities of Good Steel Rails.—A frank discussion of the present status of rail manufacture and of some of the difficulties now confronting the securing of rails of the proper quality was presented by Gustav Lindenthal in the issue of July 30, page 187. Mr. Lindenthal also suggests a new section of rail which is better adapted to rolling than the present T-rail.

The Railway Lines of Syria and Palestine.—The seldom heard of lines of these countries were described in an illustrated article in the issue of July 30, page 199. This article was largely devoted to the physical characteristics and the types of construction of these roads.

The Alaskan Government Railroad.—The progress on the construction of this line from Seward to Fairbanks was outlined in an article in the issue of August 6, page 230.

Ventilating the Stampede Tunnel of the Northern Pacific.—The Northern Pacific has recently placed in service a ventilating system at its Stampede Tunnel, two miles long, located at the summit of the Cascade Mountains near Easton, Wash. The equipment installed here was described in an illustrated article in the issue of August 6, page 234.

Canadian Pacific Draw Span Over the Lachine Canal.—An electrically-operated double track deck plate girder swing bridge over the Lachine Canal near Montreal, Que., has recently been opened to traffic by the Canadian Pacific. This bridge, which includes a deck plate girder swing span 239 feet 7 inches long, was described in the issue of August 6, page 239.

New Pittsburgh North Side Freight Station of the P. R. R.—The Pennsylvania Railroad has recently completed a new freight station for the handling of local and transfer freight in Pittsburgh, embodying a number of interesting features, which were described in an illustrated article in the issue of August 6, page 245.

Underground Cables on the Pennsylvania Railroad.—The Pennsylvania has recently completed the placing of its telephone, telegraph and signal cables underground from Jersey City to Rahway, N. J. The details of this interesting work were presented in an illustrated article in the issue of August 13, page 269.

A New Coal Dock for the Cincinnati, Hamilton & Dayton at Toledo. —During the season of closed navigation last winter, the Cincinnati, Hamilton & Dayton constructed a modern coal handling plant at Toledo. This, the most recent of the lakes' coal handling plants, was described and illustrated in the issue of August 13, page 273.

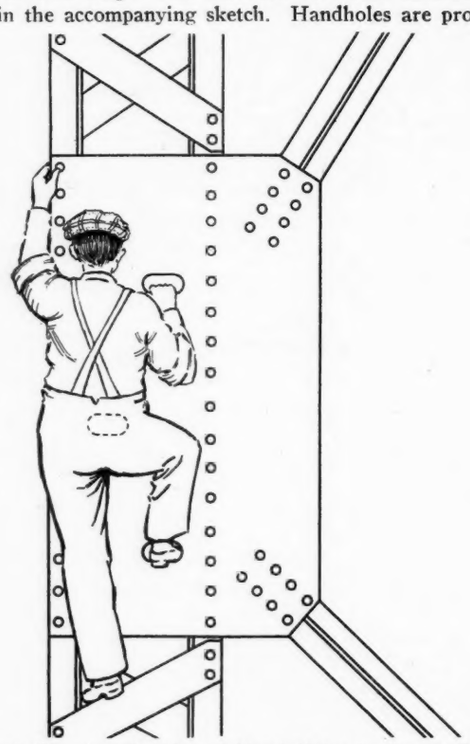
Solid Deck Trestles and Bridges on the Illinois Central.—In the construction of 34 miles of second track north of Memphis, Tenn., the Illinois Central built about 9,500 feet of concrete trestles. The interesting details of the design and construction were presented in an illustrated article in the issue of August 13, page 279.

A New Bridge Over the Missouri River at Kansas City.—The Chicago, Burlington & Quincy has recently let contracts for the construction of a new bridge across the Missouri River at Kansas City to replace the old Hannibal bridge originally built in 1869. The new structure is designed for a live load consisting of two E-90 engines followed by 7,500 lb. per ft. of track. Nickel steel will be used for the eye-bars and silicon steel for all main truss members. The details of this structure were presented in an illustrated article in the issue of August 13, page 284.

SAFETY FIRST IN BRIDGE INSPECTION

Bridge inspection must be made with a minimum of scaffolds if it is to be done quickly and efficiently, and it requires a cool head and well knit muscles. A bridge inspector is thrown almost entirely on his own resources in his effort to gain access to all parts of the structure, for, as a rule, little thought is ever given by the designer to the arrangement of details, or the addition of special devices which will be of assistance to the inspector in climbing around on a large steel bridge or viaduct.

On the Chicago, Milwaukee & St. Paul a special effort has been made to make all parts of steel bridges accessible to inspection with the minimum of risk. One feature of high viaducts which has always been a formidable obstacle to anyone who has found it necessary to climb tower columns is the large gusset plates used for bracing connections which are frequently from 6 to 8 ft. deep. This has been overcome satisfactorily as shown in the accompanying sketch. Handholes are provided in



Sketch Showing the Use of Hand Holes in Gusset Plates

the plates at convenient intervals as a substitute for the lacing which is interrupted by the presence of the large plates. The idea was originated by C. F. Loweth, chief engineer, after having observed personally the risk to which men were subjected in climbing by these plates.

Another serious matter for the inspector has been the inspection of plate girder spans more than 5 ft. in depth. This has been overcome at very little expense by providing 15/16-in. holes in the outstanding legs of the web stiffeners, to be used as holds either for a finger or a hook as the man walks along the bottom flange of the girders.

Devices such as these can be had at very little additional expense aside from the exercise of thoughtfulness on the part of the designer, and as a rule require no particular refinement of workmanship. For instance, in the case of a handhole, all that is necessary is the removal of burrs and sharp edges which would tend to cut the hands.

General News Department

The New York Central, which has in New York City three private telephone exchanges, at Grand Central Terminal, at Mott Haven passenger car yard, and at the West Side Freight Terminals, is introducing the automatic or "girlless" exchange.

The Interstate Commerce Commission has withdrawn the option which railroads heretofore had under the commission's accounting rules of charging the cost of additions and betterments amounting to $200 or less to either property account or to expenses. These small expenditures must now be charged to property account.

The Pennsylvania Railroad reports that the Broadway Limited, the 20-hour train of that company, running daily between New York and Chicago, 908 miles, arrived in Chicago on time on 92 per cent. of its trips during the first six months of 1915, and was more than two minutes late only on 15 out of the 181 days. The eastbound train was on time 163 days; and on time or not over 5 minutes late over 90 per cent of its trips. Throughout the month of June it arrived in New York on time every day.

The Pacific Mail Steamship Company has sold five of its largest steamships to the Atlantic Transport Company. This is in preparation for the discontinuance, heretofore announced, of the line between California and Asia, made necessary by the severe requirements of the new "seamen's law." The last sailing from San Francisco for the Orient will be August 25. The new owner expects to operate two of the ships through the Panama Canal and the others on the Atlantic.

The Committee of Engineers which has been organized to present matters to the New York Constitutional Convention, and whose report on the qualifications of public service commissioners was noticed in the *Railway Age Gazette,* August 6, page 244, has written a letter urging the adoption of an amendment introduced by A. R. Latson providing for the abolishment of a number of existing state departments and their consolidation into a department of engineering and public work, which would have charge of all public lands, state buildings, parks, roads and canals, and of the conservation and development of the natural resources belonging to the state. The office of state engineer and surveyor, commissioners of the land office and the canal board would be abolished, their duties being transferred to the new department. The plan would insure continuity of policy by the provision of three commissioners instead of a single head to administer the department, the incumbents to serve for long overlapping terms.

The United States Civil Service Commission announces an examination, September 14, for candidates for the position of assistant supervisor of accounts in the division of valuation, Interstate Commerce Commission, salaries from $3,600 to $4,800. Applicants must be not over 50 years old. In the rating of candidates experience will count 85 per cent. and the announcement issued by the Commission prescribes the following conditions: "Applicants must show in their applications that within the last seven years they have had at least five years' responsibile practical accounting experience in railroad or other common-carrier service, as controller, assistant controller, auditor or assistant auditor, or in public practice (as certified public accountant) in the direction of the examination of accounts of common carriers or other important public utilities, and drawing and presenting, by written report, conclusions from the facts developed in the investigations of the accounts of such utilities, or in the supervision of the accounting work of the Interstate Commerce Commission; or that they have had five years' combined experience in the several services indicated; or that they have had within the two years last past satisfactory responsible experience for at least six months with a State commission in the supervision of the accounts of common carriers, or in charge of such commission's valuation accounting work of common carriers, reporting to a state commission engaged in the effectual regulation of the accounts of such carriers, and that immediately preceding such experience they have had at least five years' responsible accounting experience in common-carrier corporate, fiscal and general accounts, or in the supervisory examination of the accounts of public utilities, or that within the last seven years they have had at least five years' combined experience in the services indicated. Certified public accountants applying for this examination must show, in their applications, that they hold certificates obtained as the result of examination. Accounting experience acquired in the position of auditor of small steam or electric railroads or of other common carriers with limited operations, or accounting experience of a routine or non-responsible character with larger carriers, or public accounting experience along commercial lines, will not be considered. No exception can be made to these requirements."

Disastrous Flood at Galveston

The city of Galveston, Texas, on August 16, 17 and 18 suffered from a hurricane and tidal flood which is reported to rival in costliness the disaster of 15 years ago. More than a score of persons were drowned and hundreds of buildings were destroyed, including large grain elevators. By the destruction of a part of the bridge or causeway by which all trains enter the city, railroad communication will be suspended for probably two weeks. In south and central Texas half the crops have been ruined, involving losses of many millions.

New Locomotive Inspection Rules

In accordance with the Act of Congress, passed last March, to extend the authority of the Interstate Commerce Commission over the inspection and testing of the entire steam locomotive and tender, rules and instructions have just been formulated by the Division of Locomotive Boiler Inspection. These will be considered at a conference with a railroad committee on August 23, at which time it is hoped that an agreement may be reached before presenting the rules to the Commission for approval. These rules are set forth in a 15-page pamphlet and cover ash pans, brake and signal equipment, cabs, warning signals and sanders, draw gear and draft gear, driving gear, lights, running gear, tenders and throttle and reversing gear.

The Ticket Seller's Best Asset

[By Oscar L. Mitchell, General Southern Agent, New York Central, in L. & N. Passenger Bulletin.]

Having been in the harness of the passenger traffic department for almost 25 years, I would like to say a word to the beginners. . . . It should be your pleasure to see to it, as far as you possibly can, that every single passenger or party using your line is made comfortable and happy all the way, whether his journey starts on your road, ends there or whether you are one of the intermediary lines; when you satisfy and please this man you earn his friendship, that of his family and of his friends, and he is always glad to see you and to help you. Let me tell you, you need the help and friendship of everyone possible. Of course, you can't have everybody strong for you, but try to have no one strong against you. The best asset you can have is a pleased and satisfied customer. A Hebrew friend of mine once told me, when you shake a man by the hand, put your heart in it, so that he can feel the beats are for him, and that you do not want to beat him. Getting through with a man quickly and getting rid of him, as some agents are prone to do, is bad business not only for your company but for yourself. Whatever you do don't argue with a customer. You know, very likely, what his wishes are. It is an old story to you, but he may not travel more than once a year and is absolutely in the dark and cannot always grasp your ideas and terms readily. . . . Take good care of the little things and you will get a chance at some of the big ones. . . .

REVENUES AND EXPENSES OF RAILWAYS

MONTH OF JUNE, 1915

Name of road.	Average mileage operated during period.	Operating revenues			Operating expenses							Net operating revenue (or deficit).	Railway tax accruals.	Operating income (or loss).	Increase (or decr.) comp. with last year.
					Maintenance										
		Freight.	Passenger.	Total. inc. misc.	Way and structures.	Of equipment.	Traffic.	Transportation.	Miscellaneous.	General.	Total.				
Alabama Great Southern	309	$271,280	$87,394	$392,280	$42,541	$98,358	$11,229	$131,532	$2,826	$7,643	$285,388	$106,892	$9,124	$97,717	$55,070
Ann Arbor	294	131,188	43,244	187,544	20,205	26,564	5,145	67,483	464	8,573	128,433	59,111	10,580	48,414	12,546
Arizona Eastern	367	195,379	34,448	245,234	33,067	36,288	2,028	60,155	766	11,677	143,868	101,367	9,821	91,545	17,803
Atlanta & West Point	93	41,365	33,717	93,566	16,003	7,817	4,900	26,341	2,469	4,234	60,400	33,166	5,525	27,632	1,885
Atlanta, Birmingham & Atlantic	639	134,827	40,986	199,856	34,633	35,455	10,556	89,196	277	10,841	180,958	18,898	12,190	6,708	—22,274
Atlantic & St. Lawrence	167	57,101	4,829	77,347	28,498	24,445	3,222	47,484	.....	3,617	107,265	—29,918	19,219	49,136	—40,674
Baltimore & Ohio System	4,535	6,820,413	1,207,581	8,662,956	915,781	1,421,997	153,083	2,696,492	50,176	222,577	5,460,404	3,202,551	290,932	2,908,846	1,560,899
Bangor & Aroostook	632	262,607	48,265	331,674	23,418	52,594	2,451	68,848	3,165	15,275	165,703	165,971	14,021	150,989	32,441
Boston & Maine	2,302	2,434,593	1,434,487	4,035,833	644,930	391,819	49,301	1,571,882	17,390	109,627	2,784,950	1,250,883	197,744	1,047,194	332,244
Buffalo & Susquehanna R. R. Corp.	253	100.130	6.269	109.411	256.634	31.135	1,123	31,558	.....	9,790	99.240	10.171	2.600	7,571	7,076
Buffalo & Susquehanna Railway	91	17,165	5,921	25,718	3,701	5,375	468	11,266	49	3,215	24,073	1.645	1,600	45	9,702
Carolina, Clinchfield & Ohio	248	156,353	12,938	173,426	23,701	23,421	7,800	34,828	.....	10,507	98,114	75,312	7,249	68,036	4,004
Carolina, Clinchfield & Ohio of S. C.	18	6,343	806	7,453	1,117	71	1,809	2,031	.....	1,332	6,359	1,094	Cr. 481	1,575	—2,123
Central New England	304	231,527	35,701	373,006	101,531	25,697	1,948	127,703	.....	5,866	262,695	110,311	240	110,071	119,598
Central of New Jersey	683	1,911,440	503,300	2,546,066	306,495	443,309	20,930	821,524	10,319	46,167	1,647,066	899,000	120,483	778,517	135,908
Central Vermont	411	235,810	126,207	396,913	34,837	32,245	8,093	125,402	1,627	5,294	207,497	189,416	12,910	176,491	28,534
Chesapeake & Ohio Lines	2,371	2,852,859	496,515	3,636,151	533,563	708,791	57,669	1,053,348	18,662	79,269	2,441,588	1,194,564	114,920	1,079,605	186,898
Chicago, Burlington & Quincy	9,366	4,724,120	1,789,896	7,260,412	1,465,079	976,401	139,171	2,241,868	68,422	184,504	5,075,446	2,184,966	462,342	1,698,466	192,957
Chicago, Det. & Can. Gd. Trunk Jctn.	60	62,023	16,475	95,176	Cr. 5,324	17,451	1,428	37,207	.....	1,444	52,207	42,969	3,638	39,330	39,179
Chicago & Eastern Illinois	1,282	740,049	225,123	1,068,103	246,070	275,686	17,747	394,817	7,329	41,079	978,539	89,564	53,600	35,914	—139,241
Chicago & Erie	270	431,655	49,845	528,320	89,137	63,110	18,514	208,815	1,782	11,706	391,692	136,628	20,500	116,128	196,992
Cincinnati, Hamilton & Dayton	1,003	708,954	126,201	920,355	225,599	210,374	18,284	351,333	3,590	19,520	827,397	92,957	40,341	52,509	622,770
Cincinnati, New Orleans & Tex. Pac.	337	567,024	122,301	737,248	77,792	159,614	15,133	220,592	5,022	20,818	497,820	239,428	31,109	208,125	50,803
Colorado & Southern	1,089	432,462	114,914	590,035	110,006	136,279	14,336	181,994	3,722	26,047	472,384	117,651	35,705	81,892	—96,823
Cripple Creek & Colorado Springs	87	92,732	25,427	120,075	17,582	11,995	3,370	29,905	.....	2,805	65,657	54,418	4,454	49,964	.....
Delaware & Hudson Co., R. R. Dept.	881	1,598,262	208,839	1,914,316	121,112	290,764	20,066	704,997	22,261	56,034	1,214,214	700,102	33,175	666,927	385
Denver & Rio Grande	2,577	1,241,878	466,997	1,865,774	203,630	343,164	48,131	456,905	44,940	48,360	1,145,130	720,645	73,306	647,251	155,135
Denver & Salt Lake	255	106,372	32,951	145,818	16,566	23,749	2,067	44,067	.....	5,268	91,707	54,111	9,276	44,835	—12,705
Detroit & Toledo Shore Line	79	109,014	.....	109,544	13,982	6,150	1,353	28,638	.....	2,793	52,916	56,627	5,046	51,582	9,568
Detroit, Grand Haven & Milwaukee	191	230,628	47,145	314,358	21,898	28,522	5,329	100,974	733	4,179	161,634	152,724	8,294	144,429	105,226
Detroit, Toledo & Ironton	441	110,843	10,839	132,249	19,000	14,716	3,697	52,640	.....	5,943	95,996	36,253	Cr. 2,300	38,535	163,423
Duluth, Winnipeg & Pacific	185	86,162	13,315	103,448	13,343	12,494	1,498	33,795	611	6,295	68,035	35,412	5,172	30,240	30,560
Erie	1,988	3,717,075	745,188	4,909,192	529,615	921,756	102,152	1,634,925	30,524	103,853	3,311,432	1,597,760	168,654	1,428,732	—170,026
Fort Worth & Denver City	454	219,373	96,001	341,551	62,690	69,705	6,706	118,971	2,252	16,941	277,267	64,284	12,429	51,855	—30,784
Galveston, Harrisburg & San Antonio	1,350	566,594	237,056	903,198	133,217	130,187	30,455	368,772	10,373	37,432	691,954	211,245	79,493	131,465	43,932
Georgia	307	112,102	56,728	184,513	24,231	19,167	12,920	86,530	Cr. 3,247	6,847	145,628	38,886	13,073	25,317	—17,158
Georgia, Southern & Florida	395	86,636	46,496	160,880	20,102	16,059	6,019	20,116	159	10,685	123,140	37,740	10,139	26,986	—13,157
Grand Trunk Western	347	536,185	109,619	701,379	91,292	94,272	14,849	219,569	6,218	11,993	438,193	263,186	Cr. 1,093	264,220	216,689
Great Northern	8,102	3,413,027	1,170,161	5,193,623	872,939	566,263	106,305	1,412,982	69,550	113,541	3,102,457	2,091,166	404,402	1,686,510	213,509
Gulf & Ship Island	308	100.689	24,456	134,034	15,818	17,960	2,403	35,244	257	6,812	78,494	55,541	7,582	47,938	17,295
Gulf, Colorado & Santa Fé	1,938	804,271	249,355	1,128,352	180,264	183,458	31,142	479,194	.....	51,394	923,680	204,673	99,062	105,543	—78,560
Houston, East & West Texas	191	80,005	26,995	118,831	29,230	18,704	2,272	40,811	782	3,661	95,308	23,523	14,326	9,173	—19,494
Houston & Texas Central	894	325,127	131,397	493,435	104,283	76,955	17,149	187,532	4,894	19,622	408,245	85,190	46,420	38,665	21,587
Illinois Central	4,767	3,406,873	1,081,407	4,881,398	944,299	1,384,526	97,298	1,578,045	28,639	135,787	4,144,897	736,502	252,238	480,550	—382,232
Kansas City, Mexico & Orient	740	157,949	27,185	196,647	52,032	39,175	8,800	104,041	.....	9,173	213,221	—16,575	10,000	—26,575	.....
Kansas City Southern	827	607,100	1,161,171	792,226	143,045	132,861	27,309	274,299	.....	38,476	605,531	186,695	48,170	138,151	—197,660
Lehigh & Hudson River	97	146,396	9,228	162,612	23,768	17,602	1,531	55,523	.....	6,350	104,775	57,837	4,995	52,843	—37
Lehigh Valley	1,442	3,019,842	369,889	3,634,848	365,672	758,668	87,898	1,191,288	13,063	107,431	2,519,978	1,114,870	134,109	975,575	—329,221
Louisiana & Arkansas	279	1,114,452	14,037	129,195	24,574	25,861	3,204	31,688	.....	3,964	89,290	39,904	7,500	32,404	19,783
Louisiana Ry. & Navigation	351	129.829	27.864	170.011	26,610	23,878	6.005	59.879	.....	5.200	121.573	48.437	13,155	35.282	—19,354
Louisville & Nashville	5,034	2,948,565	887,703	4,175,584	882,473	696,703	124,586	1,361,875	24,476	116,857	3,176,776	998,808	187,843	810,593	10,346
Midland Valley	380	75,041	31,126	112,856	14,313	13,379	2,262	42,852	.....	8,128	80,935	31,921	4,760	27,149	1,336
Minneapolis & St. Louis	1,646	594,172	169,766	815,624	98,868	106,279	17,958	286,633	90	21,809	531,638	283,986	30,303	253,683	74,965
Minn. St. Paul & Sault Ste. Marie	4,103	1,355,534	505,471	2,055,470	346,807	169,208	59,139	720,896	13,543	55,009	1,362,820	692,650	88,763	603,888	84,777
Missouri, Oklahoma & Gulf of Texas	19	9,331	304	9,834	2.003	14.545	360	10.528	.....	742	28,179	—18.345	140	—18.485	—17.197
Missouri Pacific	3,931	1,715,456	423,313	2,342,038	381,807	348,511	54,458	854,235	12,534	55,946	1,700,517	641,521	108,703	531,182	81,979
Mobile & Ohio	1,122	738,807	89,596	882,449	56,075	120,853	34,228	321,911	2,705	30,528	561,655	320,794	33,953	286,333	84,617
New Orleans Great Northern	283	101,414	24,197	139,422	17,159	23,387	2,954	35,100	192	6,286	85,077	54,345	3,083	51,108	—1,994
New Orleans, Mobile & Chicago	403	103,073	18,968	129,377	13,701	18,469	3,452	50,783	Cr. 14	7,291	93,681	35,696	6,387	29,052	—12,289
New York Central Railroad	5,979	9,137.853	4,103.358	15,404.551	1,802,283	2,123.225	231.808	4,519,852	218,602	388,509	9.284,278	6,160,273	782.854	5,375,579	.....
Northern Pacific	6,461	3,457,804	1,329,412	5,335,773	866,263	283,322	127,696	1,486,602	84,078	87,403	2,978,437	2,357,336	253,021	2,104,063	—202,416
New York, Susquehanna & Western	140	195,488	45,059	207,899	21,686	37,491	2,419	106,620	.....	5,120	173,336	97,564	13,208	84,356	19,490
Norfolk & Western	2,044	3,754,296	427,551	4,330.286	635.179	770,232	62,952	1,070.907	8,904	63,857	2,603,320	1,726,966	168,000	1,558,937	424,128
New York, New Haven & Hartford	2,005	3,017,299	2,614,655	6,327,988	508,572	840,290	70,156	1,667,566	55,843	145,804	3,287,303	3,040,685	389,921	2,650,238	1,319,963
Northwestern Pacific	401	116.989	197.043	353.865	406.647	42 994	5.571	113.770	.....	7.454	208.813	145.052	15.389	129.651	10,615
Oahu Ry. & Land Co.	114	82,204	18,946	108,513	10,298	18,003	653	24,832	.....	4,958	58,744	49,769	8,266	41,503	1,326
Oregon Short Line	2,181	1,083,484	457,024	1,674,354	259,627	217,774	35,256	415,547	28,742	53,104	1,007,232	667,123	118,396	548,285	—132,224
Oregon-Washington R. R. & Nav. Co.	2,027	767,638	419,249	1,314,264	176,811	153,447	42,735	369,237	12,985	56,364	808,865	505,399	Cr. 12,551	517,912	111,922
Panhandle & Santa Fé	670	231,468	71,578	344,334	90,822	64,736	4,435	90,166	.....	12,903	261,142	83,192	12,109	70,642	48,438
Pere Marquette	2,286	987,699	326,126	1,453,976	318,583	256,816	32.060	533.734	4,262	38,758	1,182,490	271,486	42,305	229,186	245,617

REVENUES AND EXPENSES OF RAILWAYS

MONTH OF JUNE, 1915—*Continued*

Name of road.	Average mileage operated during period.	Operating revenues			Operating expenses							Net operating revenue (or deficit).	Railway tax accruals.	Operating income (or loss).	Increase (or decr.) comp. with last year.
					Maintenance										
		Freight.	Passenger.	Total. inc. misc.	Way and structures.	Of equipment.	Traffic.	Trans. portation.	Miscel- laneous.	General.	Total.				
Pittsburgh, Shawmut & Northern	294	$133,277	$7,734	$105,593	$14,826	$33,773	$1,425	$43,901	.....	$4,775	$98,700	$51,894	$1,931	$49,962	$18,823
Richmond, Fredericksburg & Potomac	88	156,791	80,663	275,325	20,767	35,947	3,574	84,888	3,454	6,852	155,482	119,843	8,759	111,077	3,025
St. Louis & San Francisco	4,749	2,189,715	856,852	3,268,793	472,493	846,220	74,316	1,081,161	.....	88,231	2,535,247	733,547	119,792	612,148	—117,941
St. Louis, Iron Mountain & Southern	3,363	1,609,606	415,530	2,213,180	353,038	360,845	67,944	696,349	10,056	69,302	1,542,028	671,152	107,693	560,325	—93,153
St. Louis, San Francisco & Texas	235	44,232	21,083	71,382	19,813	22,167	2,296	42,744	.....	4,186	91,207	—19,826	1,216	—21,044	—3,431
St. Louis Southwestern	943	382,872	91,419	511,125	39,674	82,140	25,870	161,315	3,287	24,265	336,025	175,101	35,559	139,451	—16,920
St. Louis Southwestern of Texas	811	211,694	67,493	302,537	47,064	70,484	11,566	137,048	945	17,368	269,998	32,540	15,719	16,757	52,702
San Antonio & Aransas Pass	724	181,638	79,694	283,114	65,069	54,398	7,242	138,684	.....	10,185	275,538	7,576	17,593	—10,062	—30,260
San Pedro, Los Angeles & Salt Lake	1,132	512,207	340,207	918,710	98,481	124,528	32,263	251,988	22,183	18,184	547,626	371,084	49,896	321,205	53,690
Southern in Mississippi	281	39,016	19,090	64,046	18,926	4,079	1,981	34,121	.....	3,913	63,020	1,026	9,092	—8,167	—11,523
Spokane International	163	44,669	11,845	59,260	12,349	4,750	2,122	19,606	.....	3,003	41,831	17,429	3,877	13,547	—18,116
Spokane, Portland & Seattle	556	189,892	150,374	375,460	130,324	19,731	11,110	93,528	3,956	13,977	272,207	103,254	53,400	49,826	12,462
Tennessee Central	294	78,445	32,691	118,310	17,089	11,458	4,983	43,555	.....	6,911	83,986	34,324	6,827	27,460	16,257
Texas & New Orleans	469	246,923	80,603	333,906	70,799	92,296	7,986	120,685	6,006	10,919	308,060	25,846	30,986	—5,152	—1,782
Texas & Pacific	1,944	885,782	324,679	1,320,919	177,391	290,101	39,145	647,505	9,557	43,934	1,206,069	114,850	88,000	26,139	—67,441
Toledo, Peoria & Western	248	46,423	34,820	93,142	20,282	29,107	2,285	42,202	.....	3,768	97,644	—4,501	6,100	—10,601	—15,255
Toledo, St. Louis & Western	451	344,828	31,501	403,640	73,854	96,687	17,730	139,688	.....	8,176	336,135	67,505	5,474	62,031	—78,873
Trinity & Brazos Valley	315	33,488	11,066	49,586	14,236	9,113	2,293	27,454	.....	7,136	60,232	—10,645	4,585	—15,236	—3,414
Ulster & Delaware	129	47,430	32,499	96,655	17,263	32,356	3,776	37,915	56	3,083	94,449	2,207	6,094	—3,889	—35,475
Union Pacific	3,617	2,778,679	985,334	4,338,391	566,954	553,251	113,447	1,008,963	85,380	111,058	2,438,456	1,899,935	140,531	1,757,497	284,135
Virginia & Southwestern	240	120,734	11,843	136,540	25,448	25,078	2,109	39,099	.....	3,997	95,731	40,809	7,083	33,725	—12,453
Wabash	2,519	1,592,234	526,580	2,320,510	503,618	456,772	97,404	959,480	14,641	77,848	2,108,936	211,574	82,309	128,356	33,821
Washington Southern	36	45,054	38,905	115,325	10,924	13,837	1,355	39,478	1,481	2,887	69,962	45,363	4,204	41,159	—3,804
Western Pacific	943	337,700	228,556	615,020	99,090	58,970	22,039	167,127	17,831	17,561	382,618	232,402	37,446	194,497	77,755
Western Ry. of Alabama	133	43,273	35,313	98,274	26,958	28,846	5,666	26,387	1,703	4,499	92,385	5,889	4,785	1,085	—14,122
Yazoo & Mississippi Valley	1,382	733,468	153,965	910,241	153,313	150,787	17,177	302,908	1,416	26,825	651,967	258,274	35,150	222,879	83,058

REVENUES AND EXPENSES OF RAILWAYS

FISCAL YEAR ENDING JUNE 30, 1915

Name of road.	Average mileage operated during period.	Operating revenues			Operating expenses							Net operating revenue (or deficit).	Railway tax accruals.	Operating income (or loss).	Increase (or decr.) comp. with last year.
					Maintenance										
		Freight.	Passenger.	Total. inc. misc.	Way and structures.	Of equipment.	Traffic.	Trans- portation.	Miscel- laneous.	General.	Total.				
Alabama Great Southern	309	$3,336,119	$1,033,538	$4,776,630	$553,629	$1,149,707	$156,042	$1,694,659	$35,381	$109,044	$3,653,734	$1,122,897	$177,930	$944,263	—$22,645
Ann Arbor	295	1,633,469	528,377	2,310,902	245,682	314,401	61,347	928,700	4,634	91,116	1,645,879	665,023	143,460	520,994	43,996
Arizona Eastern	367	1,720,531	329,048	2,200,787	344,897	281,838	25,219	589,302	12,140	126,506	1,377,672	823,114	151,111	671,370	—322,069
Atlanta & West Point	93	589,243	428,846	1,185,338	168,218	254,235	64,036	373,328	20,475	55,890	934,379	250,959	75,079	175,454	—56,434
Atlanta, Birmingham & Atlantic	642	1,909,988	502,610	2,656,483	421,847	517,585	146,149	1,162,483	277	125,769	2,374,111	282,372	146,682	135,690	—324,675
Atlantic & St. Lawrence	167	1,101,855	301,080	1,557,152	239,236	252,136	47,251	700,264	.....	40,588	1,279,475	277,677	130,019	139,658	23,149
Baltimore & Ohio System	4,535	70,780,809	14,059,940	91,815,797	8,985,627	16,002,589	1,905,496	34,254,572	557,613	2,228,274	63,925,508	27,890,290	3,289,611	24,581,697	3,075,327
Bangor & Aroostook	632	2,926,867	631,082	3,763,398	521,796	583,209	36,643	1,069,673	20,184	123,056	2,347,980	1,415,418	129,917	1,284,488	14,888
Boston & Maine	2,302	27,043,544	15,518,233	46,673,049	7,195,081	6,695,420	443,690	20,193,692	200,169	1,181,720	35,909,772	10,763,277	1,978,223	8,779,110	1,534,060
Buffalo & Susquehanna R. R. Corp.	253	1,329,060	79,436	1,444,898	270,211	459,582	14,684	433,654	.....	69,358	1,247,489	197,409	31,200	116,209	—29,563
Buffalo & Susquehanna Railway	91	161,120	75,986	266,458	52,511	86,570	6,283	139,131	319	29,411	314,225	—47,767	19,200	—66,968	46,134
Carolina, Clinchfield & Ohio	248	1,911,951	170,284	2,131,162	235,529	277,794	81,193	424,441	.....	116,150	1,121,669	1,009,493	157,248	851,936	—357,650
Carolina, Clinchfield & Ohio of S. C.	18	110,827	15,200	129,614	15,049	980	20,248	24,975	.....	9,389	70,640	58,974	7,019	51,941	—31,072
Central New England	304	3,420,401	452,330	4,055,046	802,451	396,203	16,389	1,308,653	.....	49,638	2,572,654	1,482,392	139,240	1,343,116	224,673
Central of New Jersey	683	21,361,621	5,805,513	28,742,256	2,550,456	5,347,465	346,288	9,962,503	149,435	599,273	18,951,307	9,790,949	1,433,783	8,357,126	187,332
Central Vermont	411	2,667,745	925,932	3,899,659	479,339	607,876	102,156	1,748,141	24,919	84,880	3,047,311	852,348	186,260	665,333	367,380
Chesapeake & Ohio Lines	2,369	31,288,536	5,696,088	39,464,037	4,694,522	8,243,170	650,406	12,896,078	232,347	873,883	27,556,414	11,907,623	1,349,497	10,549,914	834,883
Chicago & Eastern Illinois	1,282	10,295,909	2,755,021	14,210,602	2,252,547	3,171,644	282,201	5,374,796	95,756	442,643	11,605,904	2,604,697	636,000	1,967,224	50,588
Chicago & Erie	270	4,931,781	569,991	6,050,494	901,497	505,727	223,415	2,731,893	26,966	155,047	4,492,837	1,557,656	202,993	1,354,617	1,863,169
Chicago, Burlington & Quincy	9,366	62,509,484	20,185,564	91,125,061	11,360,210	15,415,123	1,629,676	29,117,164	832,154	2,087,041	60,441,367	30,683,694	4,081,849	26,577,688	132,057
Chicago, Det. & Can. Gd. Trunk Jctn.	60	659,264	171,403	969,098	103,043	148,182	19,289	507,468	.....	17,246	795,227	173,871	35,208	138,644	36,451
Cincinnati, Hamilton & Dayton	1,011	7,227,281	1,483,122	9,725,972	1,623,524	2,123,246	234,447	4,304,052	36,325	255,522	8,571,712	1,154,260	430,141	721,710	839,943
Cincinnati, New Orleans & Tex. Pac.	337	7,176,550	1,689,010	9,422,251	926,001	2,308,581	286,201	2,975,660	74,614	241,007	6,807,448	2,614,804	372,109	2,241,689	—541,301
Colorado & Southern	1,089	5,708,135	1,386,646	7,662,277	967,225	1,756,078	128,033	2,413,104	46,580	246,764	5,557,783	2,104,493	423,150	1,680,932	62,633
†Cripple Creek & Colorado Springs	87	180,128	41,900	225,643	31,240	22,845	6,280	57,616	.....	7,179	125,160	100,483	10,244	90,239	.....
Delaware & Hudson Co., R. R. Dept.	881	18,677,039	2,722,559	22,701,942	1,619,182	3,699,840	311,582	8,179,474	155,100	752,689	14,702,656	7,999,286	659,294	7,339,504	.....
Denver & Rio Grande	2,571	15,911,102	4,449,044	21,823,236	2,541,539	3,992,351	477,425	6,290,955	345,487	651,215	14,289,671	7,533,565	1,020,606	6,511,607	388,043
Denver & Salt Lake	255	1,235,596	321,469	1,645,085	200,188	280,851	27,515	547,162	.....	62,863	1,115,108	529,978	76,776	453,202	191,240
Detroit & Toledo Shore Line	79	1,464,234	.....	1,471,160	148,066	115,773	21,743	422,944	.....	33,812	742,338	728,822	67,227	661,595	—47,624
Detroit, Grand Haven & Milwaukee	191	1,705,717	594,894	2,655,553	358,112	403,565	78,384	1,336,805	9,889	57,321	2,244,076	411,477	45,254	363,741	116,163

†Operations began May 1, 1915. Figures shown here are for two months, ending June 30, 1915.

REVENUES AND EXPENSES OF RAILWAYS

FISCAL YEAR ENDING JUNE 30, 1915—*Continued*

Name of road.	Average mileage operated during period.	Operating revenues			Operating expenses						Net operating revenue (or deficit).	Railway tax accruals.	Operating income (or loss).	Increase (or decr.) comp. with last year.
					Maintenance									
		Freight.	Passenger.	Total. inc. misc.	Way and structures.	Of equipment.	Traffic.	Trans. portation.	Miscel-laneous.	General.	Total.				
Detroit, Toledo & Ironton	441	$1,496,246	$161,386	$1,767,580	$231,830	$275,478	$45,407	$1,009,288	.....	$69,442	$1,631,443	$136,136	$58,200	$77,918	$929,133
Duluth, Winnipeg & Pacific	185	1,045,132	200,684	1,285,548	189,016	202,423	24,502	470,506	10,796	73,957	971,200	314,348	64,166	250,182	—27,421
Erie	1,988	40,728,552	8,930,348	54,780,254	5,771,539	13,071,307	1,141,663	19,870,294	367,933	1,247,569	41,352,461	13,427,793	1,593,712	11,807,039	—1,487,487
Fort Worth & Denver City	454	3,586,364	1,421,939	5,302,762	589,581	856,307	85,046	2,088,513	34,645	177,393	3,831,486	1,471,275	144,716	1,326,559	310,411
Galveston, Harrisburg & San Antonio	1,350	7,360,225	2,963,954	11,212,141	1,632,648	1,880,228	354,343	4,875,556	112,405	423,570	9,251,989	1,960,151	504,114	1,453,907	—42,578
Georgia	307	1,848,645	725,511	2,791,590	311,921	569,560	143,307	1,219,494	389	90,163	2,332,379	459,191	54,749	403,083	—255,027
Georgia, Southern & Florida	395	1,280,068	645,941	2,215,773	294,555	420,101	84,899	915,569	4,643	123,895	1,843,662	372,111	116,180	253,405	—93,613
Grand Trunk Western	347	5,056,697	1,679,897	7,238,465	1,076,831	1,432,999	224,506	3,068,116	80,163	171,149	6,054,365	1,184,100	394,027	789,188	98,515
Great Northern	8,102	47,147,314	13,164,857	67,133,303	8,261,205	7,149,929	1,167,536	18,243,491	815,184	1,258,469	36,798,928	30,334,375	4,627,944	25,703,241	1,412,470
Gulf & Ship Island	308	1,227,492	302.542	1.633.006	208.771	350.286	29.985	434.890	3,106	83.314	1.110,352	522.654	92.057	430.234	—100.864
Gulf, Colorado & Santa Fé	1,938	12,463,304	2,944,656	16,250,386	2,394,539	2,419,759	340,177	5,865,830	.....	433,911	11,440,192	4,810,195	622,115	4,184,521	1,845,327
Houston, East & West Texas	191	970,713	305,304	1,361,858	242,684	204,292	23,117	540,792	2,620	38,843	1,051,927	309,932	59,767	249,796	—74,871
Houston & Texas Central	894	4,613,313	1,475,505	6,563,488	1,196,421	934,642	186,387	2,627,577	31,172	213,231	5,182,223	1,381,264	326,445	1,053,272	385,524
Illinois Central	4,768	44,446,222	12,851,677	62,111,552	8,866,250	13,962,760	1,238,732	22,314,115	355,992	1,540,627	47,975,197	14,136,356	3,233,838	10,878,473	—861,002
†Kansas City, Mexico & Orient	.....	.....	.....												
Kansas City Southern	827	7,731,118	1,410,618	10,035,896	1,132,078	1,185,016	336,196	3,397,007	.....	489,009	6,478,821	3,557,075	574,316	2,977,274	—514,951
Lehigh & Hudson River	97	1,619,429	114,883	1,816,585	243,923	234,423	17,279	643,917	.....	54,843	1,194,386	622,199	50,645	571,555	139,662
Lehigh Valley	1,444	35,929,666	4,043,799	42,525,962	4,483,925	8,207,491	959,830	15,250,528	141,507	913,955	29,947,388	12,578,574	1,689,109	10,874,683	451,223
Louisiana & Arkansas	279	1,427,149	205,136	1,679,951	301,887	281,988	34,209	446,522	.....	49,556	1,113,721	566,230	82,400	483,574	—11,515
Louisiana Ry. & Navigation	351	1.615.799	282 354	2.023.698	377,392	223.530	68.780	802 470	.....	63,559	1.535,730	487.968	111.655	376.314	30.255
Louisville & Nashville	5,034	36,953,794	10,859,047	51,606,015	8,993,389	10,310,563	1,349,705	17,449,812	212,660	1,249,517	39,431,789	12,174,226	2,145,109	10,023,052	—2,265,103
Midland Valley	380	900,598	405,292	1,392,739	271,571	236,965	25,183	475,397	.....	71,167	1,080,823	311,916	69,833	241,430	45,784
Minneapolis & St. Louis	1,646	7,615,044	1,921,654	10,111,975	1,167,393	1,383,529	214,058	3,886,942	818	250,856	6,903,594	3,208,381	432.070	2,776,305	459,117
Minn., St. Paul & Sault Ste. Marie	4,103	19,814,289	5,805,715	27,763,225	3,307,497	3,976,753	597,521	9,230,395	169,149	610,426	17,811,374	9,951,851	1,135,439	8,816,439	46,815
Missouri, Oklahoma & Gulf of Texas	19	121,811	3,303	128,094	19,887	52,232	2,762	62,165	.....	6.546	143,592	—15.498	2.019	—17,516	—25,866
Missouri Pacific	3,921	21,245,405	4,714,086	28,325,676	3,791,799	5,342,983	687,806	11,088,205	95,395	699,951	21,699,164	6,626,513	1,213,763	5,390,773	1,757,642
Mobile & Ohio	1,122	9,120,432	1,223,754	10,982,149	1,060,127	1,868,535	460,405	4,168,852	31,189	349,192	7,933,656	3,048,493	385,591	2,660,762	196.843
New Orleans Great Northern	283	1,173,546	280,117	1,599,999	206,453	255,898	31,283	479,089	2,096	76,320	1,051,139	548,861	35,549	512,992	—195,549
New Orleans, Mobile & Chicago	403	1,399.285	278,012	1,771,473	319,663	242,564	46,098	628,651	Cr. 89	83,799	1,320,686	450,787	75,838	374,129	—292,449
*New York Central Railroad	5,979	51,056,891	20,853,465	83,672,490	9,030,678	16,314,469	1,433,945	28,444,038	1,169,219	2,127,223	58.519,571	25.152.918	4,831.818	20.316.126	.....
New York, New Haven & Hartford	2,003	31,179,319	27,010,799	65,379,264	7,729,241	9,780,330	473,369	23,958,702	592,054	1,611,243	44,126,624	21,252,640	2,743,921	18,500,888	3,844,661
New York, Susquehanna & Western	140	2,306,589	527,111	3,159,505	297,666	367,849	28,325	1,365,088	.....	67,045	2,124,839	1,034,666	84,104	938,945	161,733
Norfolk & Western	2,044	36,550,550	4,739,538	42,987,044	5,738,074	8,341,419	699,827	12,521,665	109.468	836.607	27,831.815	15.155.228	1,878.000	13,276,418	381.515
Northern Pacific	6,464	43,833,637	13,619,114	63,171,653	8,523,657	7,317,074	1,191,567	18,987,056	939,338	1,104,712	37,108,049	26,063,604	4,509,371	21,550,081	—783,375
Northwestern Pacific	401	1.342.563	1,812 062	3,568,701	601.741	501,057	61.589	1.379.689	.....	94.821	2.599.194	969,508	190.489	778.882	130.711
Oahu Ry. & Land Co	114	890,720	253,212	1,228,748	118,446	110,442	8,086	262,255	.....	50,635	549,865	678,883	87,244	591,640	34,507
Oregon Short Line	2,165	13,803,919	4,434,860	19,967,925	2,801.410	2,822,331	378,185	4,994,187	308,315	652.541	11,880,519	8,087,406	1,284.232	6,800,172	—1,486,628
OregonWashington R. R. & Nav. Co	2,003	9,722,698	4,330,584	15,446,056	1,804,445	1,924,855	468,162	5,089,700	145,426	690,519	10,057,449	5,386,607	1,050,104	4,335,163	183,671
Panhandle & Santa Fé	670	3,109,924	713,979	4,041,901	829.801	811,187	46,930	1,237,267	.....	110.814	3,034.077	1,007,824	117.140	889,122	494.967
Pere Marquette	2.286	12,562.523	3,938,086	18,028.210	2,002.282	3,492,973	379.126	7,022,741	53,045	500,859	13,444,014	4,584,196	512,844	4,069.502	5,831,648
Pittsburgh, Shawmut & Northern	294	1,682,859	119,590	1,834,056	296,229	481,050	19,933	600,837	.....	50.870	1,448,918	385,137	19,767	365,371	64,747
Richmond, Fredericksburg & Potomac	88	1,525,414	986,423	2,907,830	259,106	370,905	43,440	1,038,833	54,542	85.937	1.852.763	1,055,066	87.847	967,014	—7.714
St. Louis & San Francisco	4,747	28.182,182	10,022,692	40,901,386	5,615,881	6,789,243	802,617	13,683,611	.....	1,080,621	27,858,045	13,043,341	1,268,264	11,755,204	1,785,383
St. Louis, Iron Mountain & Southern	3,365	22,438,307	5,150,540	29,883,629	4,350,094	5,426,065	729,288	9,488,215	97,496	784,857	20,860,506	9,023,123	1,338,666	7,662,866	—2,788,734
St. Louis, San Francisco & Texas	235	773.710	289.222	1.141.030	280,341	208.503	27,321	555,544	.....	53,077	1.124.787	16.244	14.735	1.278	—138.659
St. Louis Southwestern	943	5,350,380	1,147,167	6,907,573	741,835	1,172,679	306,440	1,991,569	38,513	310,990	4,557,848	2,349,725	403,876	1,944,708	—701.560
St. Louis, Southwestern & Texas	811	2,541,262	884,890	3,720,288	844,049	903,369	143,804	1,817,258	9,258	210,888	3,803,305	—83,017	177,903	—261,966	28,083
San Antonio & Aransas Pass	724	2,503,321	1,017,034	3,797,055	827,302	731,511	79,377	1,842,718	.....	139,593	3,620,005	177,051	159,979	16.207	—486,670
San Pedro, Los Angeles & Salt Lake	1,132	6,024,777	2,633,830	9,497,896	932,581	1,414,435	386,608	3,036,483	189,441	219,278	6,178,828	3,319,068	522.545	2,795,941	—47.707
Southern in Mississippi	281	597.322	308,749	992.913	260.211	992.269	27.917	468.985	.....	44.284	900.666	92.246	101.874	—10.146	—158 315
Spokane International	163	561,083	156,651	754,235	133.371	56.559	26,822	250.224	33	41.308	508.317	245,918	51.134	194.651	—191,058
Spokane, Portland & Seattle	556	2,561,720	1,441,810	4,416,689	777,938	411,646	94,524	1,053,254	40,784	160,610	2,538,128	1,878,560	640,800	1,235,487	—211,373
Tennessee Central	294	1,006.478	382,337	1,481,404	343,617	189,901	64,605	578,814	.....	82.664	1,259,451	221,953	56,061	165,720	—188,607
Texas & New Orleans	469	2,521.740	1,023,764	3.910,706	673.924	956,971	95.163	1,581.253	95,605	127,069	3.527.658	383,048	205.725	175.296	2,777
Texas & Pacific	1,944	12,443,990	4,067,980	17,944,638	1,956,172	2,916,464	445,170	7,919,309	160,043	472,586	13,857,387	4,087,250	856,136	3,225,652	—369,150
Toledo, St. Louis & Western	451	3,984,042	330.384	4,636,059	573,700	844,225	199,811	1,783,396	.....	98,822	3,496,954	1,139,105	250,182	888,922	—356,216
Toledo, Peoria and Western	248	656.677	440.267	1,175.251	200.049	332.007	28.386	531.006	.....	43,821	1,135,269	39,983	73,200	—33,225	16,757
Trinity & Brazos Valley	315	723,886	178,800	980,592	240,373	133,459	34,648	486,348	.....	94.279	989.107	—8.515	53,060	—62.134	87.856
Ulster & Delaware	129	529,672	328,525	1,033,734	160,990	219,249	22,336	472,119	708	42,636	918,038	115,696	42,394	72,601	—127,999
Union Pacific	3,616	35,726,726	10,051,603	51,546,314	6,295,070	7,354,025	1,215,625	13,024,254	859,448	1,468,359	30,198,746	21,347,567	2,307,138	19,033,637	—154,286
Virginia & Southwestern	240	1.590.659	157,164	1,799,301	316,328	422.070	27,496	527,321	.....	45,491	1,338,706	406,595	80.815	379,769	—111.058
Wabash	2,519	20,358,026	6,126,685	29,082,788	3,759,026	5,461,031	1,038,841	12,016,110	168,548	757,377	23,178,837	5,903,951	968,877	4,931,005	412,432
Washington Southern	36	444,183	483,311	1,263,358	151,548	178,572	17,397	496,085	23.346	38,855	905,804	357,554	40,659	316,731	—8,750
Western Pacific	943	3,955.009	1,383,715	5,708,126	1,147.474	715,381	287.976	1,886,681	143,868	238.558	4,419.937	1,288,190	355,033	931,305	234.035
Western Ry. of Alabama	133	690,690	427,870	1,252,293	238,623	296,362	70,182	376,902	18,580	55,852	1,054,450	197,843	63,854	133,374	—161,227
Yazoo & Mississippi Valley	1,378	9,033,995	2,194,043	11,836,984	1,807,797	1,679,529	205,927	4,347,503	19,613	294,818	8,343,201	3,493,783	593,150	2,898,369	—363,132

* Operations began January 1, 1915. Figures shown here are for six months, ending June 30, 1915.

† No figures reported for year. Operations began July 8, 1914.

The "Old Guard" of the B. & O.

About a thousand members of the "old guard" who have served the Baltimore & Ohio Railroad for a generation, held their first annual reunion at Berkeley Springs, W. Va., on Thursday, August 12, the Martinsburg division of the Veterans' Association being the host.

The reunion brought together many of the older employees from all parts of the system, some of whom have spent more than 50 years in railroad service and had not met since they separated during the Civil War. There were 60 men present who had worked for the railroad a half century.

General Manager C. W. Galloway was the leader of a large delegation from Baltimore, who were carried in a special train, with members of their families and their grandchildren. Mr. Galloway is the third generation of his family to see service on the Baltimore & Ohio, and is the grandson of the first horse-driver and later the first locomotive engineer of the road.

Z. T. Brantner, superintendent of the shops at Martinsburg, W. Va., is the president of the Veterans' Association.

Conemaugh Division Roll of Honor

The "roll of honor," adopted as a substitute for bulletins telling of punitive discipline, as put in use by Andrew Keiser, superintendent of the Conemaugh Division of the Pennsylvania Railroad, was noticed in the *Railway Age Gazette* of March 26 last, page 689. With a view to reducing the number of cases requiring discipline, Mr. Keiser posted a bulletin showing the names of all conductors, enginemen, brakemen and firemen whose record of freedom from discipline was clear for the whole twelve months of the year 1914, omitting from the list men who had not been in active service throughout the whole year. About 400 men out of 700 found their names on the list.

Mr. Keiser has now reported the results for the first six months of 1915, and he shows, as compared with the first half of 1914, a decrease of 62 per cent. in the number of cases requiring discipline; 71 per cent. decrease in the total number of days' suspension of employees, and 72 per cent. reduction in the amount of wages lost by employees because of suspension. This last item represents a saving to employees and their families of $5,666.

Low-Cost Life Insurance for Employees

The Brooklyn Rapid Transit Company, operating and controlling extensive surface and elevated street car lines in Brooklyn, N. Y., has issued a circular to employees announcing that if a sufficient number of persons employed by the company and its subsidiaries shall take advantage of the offer, the company will have their lives insured by the Travelers Insurance Company, of Hartford, and the employer will pay half the premium on a policy of $1,000. The insurance will be what is known as term insurance, insurance taken for one year, but renewable from year to year. Under this arrangement, the premium to be paid increases each year. For example, for a person of eighteen years it is $7.47; twenty-one years, $7.59; thirty years, $8.14; thirty-five years, $8.65; forty years, $9.46; fifty years, $13.64; sixty years, $27.72; sixty-five years, $42.65, and so on. These represent the gross sums, paid by the railway company, one-half in each case to be subsequently deducted from the employee's pay on the payroll. Term insurance is not usually favored by insurance companies, but in this case, apparently, the Brooklyn Rapid Transit Company has secured concessions by promising a large contract. Employees will have the privilege of changing to ordinary forms of policies, with cash surrender privileges, etc., and will not have to take a new medical examination; that is to say, will have the same privileges as though the final contract had been made when insurance was first taken out. The company's offer to bear one-half the expense applies only to a policy of $1,000, but employees may take larger policies, at their own expense, within certain limits. If 5,000 employees accept this offer, no medical examination will be required. If less than 5,000, but more than 1,000, the insurance company will ask a certificate of the railway company's physician, but no rigid medical examination will be required. The employee must be over fifteen years of age, and must have been in the employ of the company for two years or more; and it is said that there are over 8,000 persons thus eligible. Employees must be members of the Employees' Benefit Association, if eligible thereto, so that there may be no competition between the two schemes of insurance. In the case of pensioned or disabled employees, the railway company expects to pay the entire premium on $1,000.

The plan will not go into effect unless at least 1,000 employees desire to join.

Chief Interchange Car Inspectors and Car Foremen

The seventeenth annual convention of the Chief Interchange Car Inspectors' and Car Foremen's Association of America will be held at Murphy's Hotel, Richmond, Va., September 14-16. This is the first time that the meeting of the association has been held so far south, and it is suggested that this will offer a good opportunity for southern railroad men to attend.

Foundry and Machine Exhibition

The Foundry and Machine Exhibition will be held on Young's Million Dollar Pier, Atlantic City, from September 25 to October 1. This is the first time in three years that the exhibit has been held in the east and there will be a keen interest in it in that section particularly. Business conditions in this line are improving everywhere, and the attendance promises to be large and the exhibit a profitable one for the exhibitors. From all indications, therefore, the exhibit should be as successful as the one in Chicago last year. C. E. Hoyt, the secretary, has opened an office in the Bourse, Philadelphia, for the convenience of exhibitors and others desiring information or help of any kind.

Master Blacksmiths' Convention

The twenty-third annual convention of the International Railroad Master Blacksmiths' Association was held at the Walton Hotel, Philadelphia, Pa., August 17 to 19, T. F. Buckley, foreman blacksmith, Delaware, Lackawanna & Western, presiding. The meeting was opened with prayer by the Rev. Father Stapleton, followed by the president's address and the address of welcome, by Edward J. Cattel, statistician of the city of Philadelphia. C. E. Chambers, superintendent of motive power, Central Railroad of New Jersey, spoke on the "Progress of Foremen Blacksmiths in Railroad Service," and Charles E. Carpenter, president of E F. Houghton & Co., gave a talk on general subjects, concluding with a brief reference to heat treatment of steel. A further report of the convention will appear in a later issue of the *Railway Age Gazette*.

The following companies have exhibits at the convention:

Acme Machinery Company, Cleveland, Ohio.—Machine forgings manufactured with Acme machines. Represented by C. W. Durschlag.

Ajax Manufacturing Company, Cleveland, Ohio.—Machine forgings, products of Ajax forgings machines. Represented by J. R. Blakesley, A. L. Guilford, J. A. Murray and C. E. Wicks.

Anti-Borax Compound Company, Fort Wayne, Ind.—"E-Z" welding compound. Represented by Chas. O. Kahre.

Houghton, E. F., & Company, Philadelphia, Pa.—Case-hardening materials, quenching oils and compounds, finished heat-treated products and a line of mechanical leathers. Represented by Emil Nissen, W. J. Boyd and J. W. Kelley.

MEETINGS AND CONVENTIONS

The following list gives the names of secretaries, dates of next or regular meetings, and places of meeting of those associations which will meet during the next three months. The full list of meetings and conventions is published only in the first issue of the Railway Age Gazette for each month.

AMERICAN ASSOCIATION OF DINING CAR SUPERINTENDENTS.—H. C. Boardman, D. L. & W., Hoboken, N. J. Next meeting, October 21-23, 1915, Boston, Mass.

AMERICAN ASSOCIATION OF RAILROAD SUPERINTENDENTS.—E. H. Harman, Room 101, Union Station, St. Louis, Mo. Next meeting, August 19-20, 1915, San Francisco, Cal.

AMERICAN ELECTRIC RAILWAY ASSOCIATION.—E. B. Burritt, 8 W. 40th St., New York. Annual convention, October 4-8, 1915, San Francisco, Cal.

AMERICAN ELECTRIC RAILWAY MANUFACTURERS' ASSOCIATION.—H. G. McConnaughy, 165 Broadway, New York. Meetings with American Electric Railway Association.

AMERICAN RAILWAY BRIDGE AND BUILDING ASSOCIATION.—C. A. Lichty, C. & N. W., Chicago. Next convention, October 19-21, 1915, Detroit, Mich.

AMERICAN SOCIETY OF CIVIL ENGINEERS.—Chas. Warren Hunt, 220 W. 57th St., New York. Regular meetings, 1st and 3d Wednesday in month, except July and August, 220 W. 57th St., New York.

ASSOCIATION OF MANUFACTURERS OF CHILLED CAR WHEELS.—George W. Lyndon, 1214 McCormick Bldg., Chicago. Annual meeting, 2d Tuesday in October, 1915, New York.

ASSOCIATION OF RAILWAY ELECTRICAL ENGINEERS.—Jos. A. Andreucetti, C. & N. W., Room 411, C. & N. W. Sta., Chicago. Annual meeting, October, 1915.

BRIDGE AND BUILDING SUPPLY MEN'S ASSOCIATION.—L. D. Mitchell, Detroit Graphite Co., Chicago, Ill. Meetings with American Railway Bridge and Building Association.

CANADIAN RAILWAY CLUB.—James Powell, Grand Trunk, P. O. Box 7, St. Lambert (near Montreal), Que. Regular meetings, 2d Tuesday in month, except June, July and August, Windsor Hotel, Montreal, Que.

Canadian Society of Civil Engineers.—Clement H. McLeod, 176 Mansfield St., Montreal, Que. Regular meetings, 1st Thursday in October, November, December, February, March and April. Annual meeting, January, Montreal.

Car Foremen's Association of Chicago.—Aaron Kline, 841 Lawlor Ave., Chicago. Regular meetings, 2d Monday in month, except June, July and August, Hotel La Salle, Chicago.

Central Railway Club.—H. D. Vought, 95 Liberty St., New York. Regular meetings, 2d Friday in January, May, September and November. Annual meeting, 2d Thursday in March, Hotel Statler, Buffalo, N. Y.

Engineers' Society of Western Pennsylvania.—Elmer K. Hiles, 2511 Oliver Bldg., Pittsburgh, Pa. Regular meetings, 1st and 3d Tuesday, Pittsburgh.

General Superintendents' Association of Chicago.—A. M. Hunter, 321 Grand Central Station, Chicago. Regular meetings, Wednesday, preceding 3d Thursday in month, Room 1856, Transportation Bldg., Chicago.

International Railroad Master Blacksmiths' Association.—A. L. Woodworth, C. H. & D., Lima, Ohio. Annual meeting, August 17, 1915, Philadelphia, Pa.

Maintenance of Way and Master Painters' Association of the United States and Canada.—T. I. Goodwin, C. R. I. & P., Eldon, Mo. Next meeting, October 19-21, 1915, St. Louis, Mo.

Master Car and Locomotive Painters' Association of the United States and Canada.—A. P. Dane, B. & M., Reading, Mass. Next convention, September 14-16, 1915, Detroit, Mich.

New England Railroad Club.—W. E. Cade, Jr., 683 Atlantic Ave., Boston, Mass. Regular meetings, 2d Tuesday in month, except June, July, August and September, Boston.

New York Railroad Club.—Harry D. Vought, 95 Liberty St., New York. Regular meetings, 3d Friday in month, except June, July and August, 29 W. 39th St., New York.

Niagara Frontier Car Men's Association.—E. N. Frankenberger, 623 Brisbane Bldg., Buffalo, N. Y. Meetings, 3d Wednesday in month, New York Telephone Bldg., Buffalo, N. Y.

Peoria Association of Railroad Officers.—M. W. Rotchford, 410 Masonic Temple Bldg., Peoria, Ill. Regular meetings, 3d Thursday in month, Jefferson Hotel, Peoria.

Railroad Club of Kansas City.—Claude Manlove, 1008 Walnut St., Kansas City, Mo. Regular meetings, 3d Saturday in month, Kansas City.

Railroad Men's Improvement Society.—J. B. Curran, Erie R. R., 50 Church St., New York. Meetings, alternate Thursdays, October to May. Assembly Rooms of Trunk Line Association, 143 Liberty St., New York.

Railway Club of Pittsburgh.—J. B. Anderson, Room 207, P. R. R. Sta., Pittsburgh, Pa. Regular meetings, 4th Friday in month, except June, July and August, Monongahela House, Pittsburgh.

Railway Electrical Supply Manufacturers' Association.—J. Scribner, 1063 Monadnock Block, Chicago. Meetings with Association of Railway Electrical Engineers.

Railway Fire Protection Association.—C. B. Edwards, Fire Ins. Agt., Mobile & Ohio, Mobile, Ala. Next meeting, October 5-7, 1915, Chicago.

Railway Signal Association.—C. C. Rosenberg, Myers Bldg., Bethlehem, Pa. Annual meeting, September 14-17, 1915, Salt Lake City, Utah.

Richmond Railroad Club.—F. O. Robinson, C. & O., Richmond, Va. Regular meetings, 2d Monday in month, except June, July and August.

Roadmasters' and Maintenance of Way Association.—L. C. Ryan, C. & N. W., Sterling, Ill. Annual meeting, September 14-16, 1915, Chicago.

St. Louis Railway Club.—B. W. Frauenthal, Union Station, St. Louis, Mo. Regular meetings, 2d Friday in month, except June, July and August, St. Louis.

Salt Lake Transportation Club.—R. E. Rowland, David Keith Bldg., Salt Lake City, Utah. Regular meetings, 1st Saturday of each month, Salt Lake City.

Signal Appliance Association.—F. W. Edmunds, 3868 Park Ave., New York. Meetings with annual convention Railway Signal Association.

Society of Railway Financial Officers.—Carl Nyquist, C. R. I. & P., 1134 La Salle St. Sta., Chicago. Annual meeting, October 19-21, Colorado Springs, Colo.

Southern & Southwestern Railway Club.—A. J. Merrill, Grant Bldg., Atlanta, Ga. Regular meetings, 3d Thursday, January, March, May, July, September, November, 10 A. M., Piedmont Hotel, Atlanta.

Toledo Transportation Club.—Harry S. Fox, Toledo, Ohio. Regular meetings, 1st Saturday in month, Boody House, Toledo.

Track Supply Association.—W. C. Kidd, Ramapo Iron Works, Hillburn, N. Y. Meetings with Roadmasters' and Maintenance of Way Association.

Traffic Club of Chicago.—W. H. Wharton, La Salle Hotel, Chicago.

Traffic Club of Newark.—John J. Kautzmann, P. O. Box 238, Newark, N. J. Regular meetings, 1st Monday in month, except July and August, The Washington, 559 Broad St., Newark.

Traffic Club of New York.—C. A. Swope, 291 Broadway, New York. Regular meetings, last Tuesday in month, except June, July and August, Hotel Astor, New York.

Traffic Club of Pittsburgh.—D. L. Wells, Gen'l Agt., Erie R. R., 1924 Oliver Bldg., Pittsburgh, Pa. Meetings bi-monthly, Pittsburgh.

Traffic Club of St. Louis.—A. F. Versen, Mercantile Library Bldg., St. Louis, Mo. Annual meeting in November. Noonday meetings October to May.

Transportation Club of Detroit.—W. R. Hurley, Superintendent's office, N. Y. C. R. R., Detroit, Mich. Meetings monthly, Normandie Hotel, Detroit.

Traveling Engineers' Association.—W. O. Thompson, N. Y. C. R. R., East Buffalo, N. Y. Annual meeting, September 7-10, 1915, Chicago.

Utah Society of Engineers.—Frank W. Moore, 1111 Newhouse Bldg., Salt Lake City, Utah. Regular meetings, 3d Friday in month, except July and August, Salt Lake City.

Western Canada Railway Club.—L. Kon, Immigration Agent, Grand Trunk Pacific, Winnipeg, Man. Regular meetings, 2d Monday, except June, July and August, Winnipeg.

Western Railway Club.—J. W. Taylor, 1112 Karpen Building, Chicago. Regular meetings, 3d Tuesday in month, except June, July and August, Karpen Bldg., Chicago.

Western Society of Engineers.—J. H. Warder, 1735 Monadnock Block, Chicago. Regular meetings, 1st Monday in month, except January, July and August, Chicago. Extra meetings, except in July and August generally on other Monday evenings. Annual meeting, 1st Wednesday after 1st Thursday in January, Chicago.

Traffic News

A regular meeting of the Southern Classification Committee will be held at the Hotel Sherman, Chicago, on November 8. The docket closes 30 days prior to that date.

The Canadian Pacific expects to carry 15,000 harvest workers to the northwest provinces between August 19 and August 28. Reduced fares are provided and special trains will be run where necessary.

The troublesome Shreveport rate situation may bring on a clash between the Interstate Commerce Commission and the Texas Commission. Railroad Commissioner Earle B. Mayfield, of Texas, threatens to have the state attorney general file suit against the Texas railroads to enjoin them from obeying the recent order of the federal commission commanding them to apply the same freight rates to Dallas and other points in Texas as are applied to Shreveport.

The express companies operating in New York state have filed with the Public Service Commission, Second District, new tariffs for the transportation of merchandise showing increases similar to those which have been allowed for interstate traffic, the changes to take effect September 1. In Georgia the express companies have presented a petition, asking similar authority, to the State Railroad Commission, and that body will give a hearing on the subject August 25.

A committee of Texas shippers has requested of the Interstate Commerce Commission a suspension until January 1 of its supplementary order in the Shreveport case. The basis of the request is stated to be: First, that great confusion is certain to follow the establishment of new rates; and second, that the Texas Commission has now before it applications from Texas carriers for an advance in rates which are likely to be decided before the end of the year.

The Southern Railway and its affiliated lines are to make exhibits at thirty state, district and county fairs in the North and Middle West during the coming fall. A fine collection of grains, grasses and forage crops will be shown. From the wheat-growing section of the South, grain sheaves will be shown from fields yielding as high as 40 bushels to the acre. The first two exhibits will be shown at fairs in Indiana. For all fairs in the middle west a special exhibit tent has been provided, arranged so that a large number of people can see the exhibit at the same time.

Duluth shipping interests are preparing to contest before the Interstate Commerce Commission the general advance in rail and lake rates recommended on July 14, at a meeting in Chicago between representatives of eastern trunk lines, boat lines and Duluth-Twin City lines. The hearing will begin in Chicago on September 29. The shippers propose a scale of lake class rates from Buffalo to Duluth, based on 35 cents first class. The Duluth interests rely upon the latest decision of the commission to the effect that any class rates that exceed 83 cents, first class, from New York to the Twin Cities, rail-lake-and-rail, with corresponding rates from other points, would be unreasonable.

To show the magnitude of automobile traffic on Long Island General Manager McCrea, of the Long Island Railroad, has had a count made of the motor cars driven across his tracks. On Sunday, August 8, at the Merrick Road crossing, in Springfield, 9,408 automobiles passed between midnight and midnight. Of these 4,245 were eastbound and 5,163 westbound. At the Barnum Island road crossing, on the Long Beach branch, 4,739 cars passed in the same period, of which 2,620 were eastbound and 2,119 westbound. In the single hour from 11 a. m. to noon on Sunday, 845 motor cars passed over the Merrick road crossing. This is at the rate of more than 14 cars a minute, or about one every four seconds. Nearly all of these cars must have crossed the Long Island tracks at other points, not once but several times. Heavy pole gates similar to those recently put up on the Long Beach branch have been installed at Central Islip. The road has been authorized by the supervisors of Nassau county to install at certain points traffic posts similar to those used by the New York City traffic squad, to serve as route indicators for motorists.

The Arkansas Rate Situation

W. B. Biddle, receiver and chief traffic officer of the St. Louis & San Francisco, has issued a statement concerning the rate situation in Arkansas, appealing especially to "any person who believes in a square deal."

The Arkansas state freight rates have been in litigation for nearly eight years, and have twice been reviewed and passed upon by United States courts. In the first place it was held by the courts that the rates that the railroads were permitted to charge, taken in connection with the passenger rates then in force, did not give the carriers a reasonable compensation; that the roads were entitled to an increase of 33 1/3 per cent in their revenue. This decision of the courts was followed by a conference between the commission and the railroads, which resulted in the so-called "court tariff." The court tariff gave the Frisco road an increase of only 13½ per cent in its freight revenues, but it was accepted in good faith, as an experiment, with the intention of asking for a revision if the results were unsatisfactory. This tariff remained in effect until the decision of the supreme court in the Minnesota rate case.

At that time the Frisco voluntarily reinstated its previous commission tariff, the one condemned by the court as affording inadequate revenue, so that pending the final hearing for the Frisco's application for higher rates the public might have the benefit of the low rates. This tariff was again taken into court and a decision rendered in April, 1915, which declared that under the rates established by the commission business was done at an actual loss. The Frisco then prepared and issued a new tariff, having in mind that the decision gave the road opportunity to submit a tariff that would represent the carrier's views of reasonable and defensible freight rates. Officers of other important Arkansas lines were consulted and changes were made at their suggestions. The Arkansas commission was advised of the terms of the tariff and a conference was requested for the purpose of securing an expression from the commission; but the tariff was rejected without any analysis of its terms. Thereupon the new tariff was put into effect by the Frisco. It was at once attacked by the commission; and, upon hearing, the court held that the new rates were unreasonable wherever they were in excess of the interstate rates then in effect into or out of Arkansas. The court, however, did not say that the revenue derived from the new tariff was excessive, either as a whole or as applied to the rates that were higher than the interstate rates; nor did the decision say that the new rates were unreasonable in and of themselves. Another new tariff was consequently prepared and went into effect on July 26, 1915.

In explanation of Frisco Tariff No. 2806, the one which was rejected by the commission, Mr. Biddle emphasizes the fact that it was intended to represent the views of experienced and responsible traffic men as to what constitutes fair and defensible freight rates. As it was, confessedly, a tariff made by the railroad itself, the rates shown therein could probably be held to be the maximum rates that the carrier felt that it should be permitted to charge. Mr. Biddle says:

"The rates carried by other lines in the state of Arkansas are not voluntary rates; they are made by the Arkansas commission and are protested by the roads. Many of the interstate rates into or out of the state of Arkansas are not voluntary rates; many of the rates carried in the surrounding states are not voluntary rates; so that in submitting what was believed to be a reasonable tariff some of these conditions were ignored to a large extent."

It is further stated that while the new tariff represented the judgment of the road's officers as to a reasonable basis of rates, the Frisco did not then and does not now hold that every rate in the new tariff is the proper one. The road is prepared to discuss the rates with the commission or with interested shippers, and make such modification as may be reasonable. In the matter of joint rates with other lines, the Frisco has never desired nor intended to discontinue making joint rates. It is ready to make them today; but so long as a different basis of rates prevails on different lines it is difficult to see how this can be accomplished. In conclusion, the statement insists that this is a plain business proposition; the road believes itself entitled to greater compensation than it is receiving and is preparing to use all honorable means to accomplish this result.

Commission and Court News

INTERSTATE COMMERCE COMMISSION

Rates on High Explosives to New England Points

Nitro Powder Company v. West Shore et al. Opinion by the Commission:

The commission finds that the present C.L. and L.C.L. rates on high explosives from Kingston and Port Ewen, N. Y., to Boston, Mass., and to other New England points, are unreasonable to the extent that they exceed the first-class and double first-class rates, respectively, between these points. One reason for these high rates is the lack of joint rates. The commission, therefore, describes through routes and joint rates for the future, and awards reparation. (35 I. C. C., 77.)

Cement Rates from Cape Girardeau, Mo.

Cape Girardeau Portland Cement Company v. St. Louis & San Francisco et al. Opinion by Commissioner Meyer:

The commission finds that the rates on cement in carloads from Cape Girardeau, Mo., to points in southern Arkansas, which are not at least three cents per 100 lb. lower than the rates from St. Louis, Mo., to the same points are discriminatory. In like manner it is found that the rates from the same point to points in Louisiana west of the Mississippi, to points in Mississippi, except points on the Mississippi river, and to points in Kentucky and Tennessee, west of the Tennessee river, except Paducah, Ky., and Memphis, Tenn., which are not at least two cents per 100 lb. lower than the rates from St. Louis, are discriminatory. Combination rates on cement in carloads from Cape Girardeau to points in southern Illinois are found unreasonable and discriminatory in favor of competing points in Missouri, Illinois and Indiana, and reasonable maximum joint rates are prescribed. (35 I. C. C., 109.)

The Ogden Gateway Case

In re increased passenger fares via the Denver & Rio Grande through the Ogden and Salt Lake City gateway. Opinion by Commissioner Harlan.

A very brief resumé of this case was given in this column last week. The Union Pacific has proposed to cancel the joint passenger fares in effect since 1897 in connection with the Denver & Rio Grande between points in the territory of the Oregon Short Line and points east of and including Colorado common point territory. The issue originally dealt with a proposed cancellation of through rates, which would have eliminated an option whereby patrons traveling between the eastern points designated and points on the Short Line could use the Denver & Rio Grande between Denver and Ogden or Salt Lake City. The decision was enlarged, however, to include all the joint rates in effect with the Rio Grande mentioned.

The route via the Union Pacific and the Short Line from Omaha to Pocatello, Idaho, is 383 miles shorter than the shortest route over the Burlington to Denver, thence by the Rio Grande to the gateway and the Short Line beyond. The Union Pacific in addition to operating the most direct route to this and similar points, also operates the faster and more adequate service. The route of the Rio Grande has been used very extensively by passengers to and from points on the Short Line, the reason being that the scenic effects over the former are among the best in the country.

The Union Pacific contends that it has a legal right under Section 15 of the act, to cancel the through route arrangements and joint passenger fares in question because the route over the Rio Grande requires it to short haul itself. It wishes to give its system a longer haul than it now enjoys on this traffic and alleges that the rates (made on the basis of its own direct line) over the circuitous Denver & Rio Grande route are not sufficiently remunerative to either system.

The commission agrees with the carriers' contentions and will allow the cancellations proposed. It meets with approval a sug-

gestion that the round-trip tickets to Yellowstone Park be made available in one direction over the Rio Grande, and suggests itself that a through service still be maintained over the latter, although at higher rates than the present ones.

The commission does not perceive from the language of the act that it has any larger or different powers when dealing with tariffs by which it is proposed to cancel an existing through route than it has in connection with establishing a through route and just rates applicable thereto where no such route has already been established. The long continuance of a through route and of joint rates on traffic moving over it is often a fact of substantial importance and one that must always be considered; it has never been held, however, to be a controlling factor in any case. "Our authority in such matters is statutory and can not be enlarged by the previous course of the carriers. We think it clear that we have no power under Section 15, nor should we assume the power, to prevent the cancellation of through routes and joint rates voluntarily established by the carriers when, as in this case, the circumstances and conditions are such as would not warrant an order to compel such arrangements if not already in effect."

Commissioner McChord dissents (35 I. C. C., 131.)

The Cummins Amendment

The commission has issued the following:

"On May 7, 1915, the commission issued a report expressing tentatively its views upon various questions arising in connection with the Cummins amendment (*Cummins amendment,* 33 *I. C. C.,* 682). Among other things, attention was called to the provision of Section 10 of the act penalizing any person who by false statement as to value, or by any other device, obtained or attempted to obtain transportation for property at less than the regular rates. The numerous inquiries regarding this matter indicate confusion in the minds of many as to the application of Section 10, and seem to render desirable a further expression of opinion by the commission upon this point.

"There is no provision in the act to regulate commerce, including the Cummins amendment, that requires a declaration as to the value of property shipped in interstate commerce; nor has the commission issued any ruling that requires such declaration.

"The Cummins amendment does, however, provide that if the goods are hidden from view by wrapping, boxing, or other means, and the carrier is not notified as to their character, 'the carrier may require the shipper to specifically state in writing the value of the goods.' In such cases rates and charges for transportation, dependent upon the value of the property shipped as specifically stated in writing by the shipper, may be established and maintained.

"It is the view of the commission that, so far as declarations as to value are concerned, the prerequisites for the application of Section 10 are—First, the election of the carrier to require a shipper to state in writing the value of the goods; second, the existence of graded rates or charges dependent upon the value of the property shipped; and, third, that the shipper shall knowingly and wilfully by false statement as to value obtain or attempt to obtain transportation for such property at less than the regular rates."

Anthracite Coal Rates to Chicago

Opinion by Commissioner McChord:

The commission finds that the carriers have justified a proposed increase of 25 cents per gross ton on anthracite coal, prepared sizes, all-rail in carloads from anthracite mines in northeastern Pennsylvania to Chicago and Chicago rate points and to points of connection between eastern and western lines near Chicago, such as Joliet, Kankakee, Griffith and others, and to the other points of connection between such lines, Peoria, East St. Louis and St. Louis.

Through rates are effective on all of the lines from the mines to Chicago and to Chicago rate points and to Peoria, East St. Louis and St. Louis. Of the through rates, $1.75 formerly constituted the division accruing to the trunk line carriers for the haul from the mines to Buffalo as opposed to the local rate of $2 on all lines for that haul. But to points intermediate to Chicago and to other points in Ohio, Indiana and Michigan, to which no through joint rates apply, the rate applicable is made by the combination of the local $2 per gross ton rate from the mines to Buffalo and the local or reshipping rate from Buffalo west to destination, by which combination there is brought about a freight charge of 25 cents a gross ton more to those points which commonly take the same rate as Chicago than the former joint through rate to Chicago.

The entire increase of 25 cents is apportioned as compensation for that part of the through haul between the mines and Buffalo on shipments via Buffalo on the lines running to Buffalo, so that on such shipments carriers will receive no increase for that part of the through haul between Buffalo and the named points of destination, and the rate to Buffalo will be uniformly $2, regardless of the destination of the shipments. But as to shipments moving west, not via Buffalo, over the Erie or Pennsylvania railroads, which extend by their own rails from the mines to Chicago, the increase is necessarily apportioned over the entire mileage from the mines to Chicago.

Respondents assert that they have proposed the increased rates in view of a complaint that certain discriminations against dealers in and consumers of anthracite coal in Ohio, Indiana and Michigan have been created by the effective rates.

This issue is determined by the commission's finding in the *Rates for Transportation of Anthracite Coal* (35 I. C. C., 220), where a rate of $2 per gross ton was found to be reasonable for the haul from the mines to Buffalo. Nothing has been made to appear here that would warrant the commission's requiring the trunk-line carriers to accept less revenue on the transportation here involved than they receive to the intermediate points in Ohio, Indiana and Michigan. (35 I. C. C., 702.)

Rates on Railroad Fuel in Southeastern Territory

In the matter of rates, divisions, rules, regulations and practices governing the transportation of railroad fuel and other coal. Opinion by Commissioner Meyer:

The Seaboard Air Line, the Atlantic Coast Line and the Charleston & Western Carolina purchase the greater part of their fuel coal from the Clinchfield Fuel Company and other mines on the lines of the Carolina, Clinchfield & Ohio (owned by the same interests that own the Fuel Company) or its connections.

In 1914 these three carriers purchased something over 800,000 tons of coal from mines on the Clinchfield or its connections. The total tonnage of bituminous coal hauled by that railroad was 1,206,000; the railroad fuel coal constituted about two-thirds of this traffic, and about one-half of the total tonnage of all kinds. This shows how important it is that producers on the Clinchfield should secure the contracts of these three roads.

The fuel coal purchased by the Seaboard and moving via the Clinchfield is received at various junction points. Much of the Seaboard coal is delivered to it by the Clinchfield Railway at Bostic. The coal is billed to Ellenboro, but all of it is transported to Charlotte, Munroe, Hamlet, and Wilmington, N. C., which are points on the Seaboard beyond Ellenboro. Ellenboro is a small town of three or four hundred inhabitants, about 5 miles from Bostic, the junction point. The haul from the point of origin to Bostic performed by the Clinchfield Railway is approximately 240 miles, and so to Ellenboro the haul is approximately 245 miles. The joint through rate on coal between the points of origin and Ellenboro, the billed destination, is $2.15 per ton. Under the divisions in effect at the present time the Clinchfield Railway receives 99 cents for its haul of 240 miles and the Seaboard receives $1.16 for its haul of 5 miles. Below are shown the distances from Bostic, the junction point, to Ellenboro and to the points of consumption, together with the joint rates and divisions now effective from the mines to these points:

Station.	Miles from junction.	Rate per ton.	C., C. & O. division.	Seaboard division.
Ellenboro	5.7	$2.15	$0.99	$1.16
Charlotte	72	2.25	1.35	.90
Munroe	97	2.25	1.35	.90
Hamlet	149	2.40	1.32	1.08
Wilmington	260.8	2.05	.92	1.13

The coal moves over the Clinchfield on a revenue waybill reading to Bostic, final destination Ellenboro. Upon the arrival of the coal at Bostic it is "reconsigned" by the agent to the various points of actual consumption, and the agent at Bostic takes into his accounts the Ellenboro waybills and issues from that point what are known as company deadhead waybills. That agent pays to the Clinchfield Railway its division of 99 cents of the Ellenboro rate. The coal is moved from Bostic to Ellenboro in through trains without stopping at that point. There is nothing in the entire transaction to indicate that the coal was at any time

destined to Ellenboro, except that that point was named in the initial waybill. The other two carriers receive their coal under like arrangements.

The findings of the commission are as follows:

The character of a shipment and not formal incidents, such as billing, determines the rate and divisions applicable. The rates and divisions to points of actual destination must be applied to railway fuel coal shipments here involved, and the application of rates and divisions to fictitious billed destinations is unlawful and can not be justified by the theory that such rates and divisions would be proper rates and divisions to the average point of actual destination.

A railroad company as shipper is entitled to the same consideration as any commercial shipper and no more, even when the shipment moves in part over the rails of such railroad company. It follows that in such case the carrier is entitled to a division of the joint through rate. But the division must be fixed by the same considerations which would determine divisions upon a through commercial shipment in which the railroad had no interest other than that of carrier. The divisions now received out of the joint rate on supply coal by the Seaboard Air Line, the Atlantic Coast Line, and the Charleston & Western Carolina for the hauls from their junctions are special and abnormal divisions.

The commission may fix divisions when a railroad company is the shipper or is owned by the shipper so that the division of a through rate might be the means of indirectly reducing transportation charges or effecting discriminations. Divisions here involved will not be fixed by order at this time, but carriers will be expected to adjust them to meet views herein expressed.

The commission may order that such divisions be filed with it and it is so ordered as to the divisions applicable to fuel coal shipments herein involved.

The commission states:

"The question of the proper method of handling fuel-coal rates and divisions is an old one, and the commission is impressed with the fact that some of the carriers have not endeavored to meet the views heretofore announced. We shall therefore look with great care to the steps taken by the carriers to meet the views herein set forth, and the next time we have to deal with a situation like that here presented we will do so under the criminal provisions of the act." (36 I. C. C., 1).

STATE COMMISSIONS

The Chesapeake & Curtis Bay Railroad Company has applied to the Public Service Commission of Maryland for authority to exercise its franchise, the purpose of the company being to take over the tracks in Baltimore which are owned by the United States Asphalt Company. It is proposed to extend these tracks to serve additional industries; but the Baltimore & Ohio is objecting to this proposal, claiming that the territory in question has been developed by the B. & O.

The Missouri Public Utilities Commission and the railroads of the State on August 10 reached an agreement under which grain rates will be increased approximately five per cent., subject to the approval of the Interstate Commerce Commission. The rates agreed upon are substantially the old schedule of interstate rates that were effective before the statutory rates were put in force. They are made applicable to both St. Louis and East St. Louis, without bridge toll, and will absorb necessary switching charges at points of origin and destination; and they also will permit milling in transit or re-handling at intermediate points in Missouri without additional charge.

COURT NEWS

Railroad Not Liable for Injuries Caused by Ditch Constructed but Not Owned by It

A railroad company built its road through an unimproved street of a town, and its franchise from the town required it to square up the sides and bottom, and construct concrete retaining walls for the sides and bottom, of a certain ditch running along the street, which supplied its natural drainage. The ditch had no connection whatever with the railroad, and its improvement as required by the town was of no benefit to the railroad. The Alabama Supreme Court holds that the railroad was not liable for injuries to a pedestrian from falling into the ditch.—Bush vs. Seaboard Air Line (Ala.) 68, So. 1011.

Liability for Injury to Stalled Automobile

Through some unknown cause an automobile engine stopped on a railroad crossing in the open country. A heavy passenger train was speeding towards the crossing at 55 miles an hour from a point in plain view half a mile away. The occupants of the car stepped out and began to try to crank it and push it from the track. The engineer of the train made an emergency application of the brakes as soon as he had a chance to discover that the car was stalled on the track, but the train was not stopped in time to prevent a smash. The court held that, as the train could not have been stopped in time to avoid a collision with the automobile without serious injury to the railroad's property by the abrupt stoppage, the company was not negligent nor liable for the value of the car.—McBeth v. Atchison, T. & S. F. (Kan.), 148 Pac. 621.

Liability for Assaults by Fellow Passengers

In Massachusetts a passenger sued a carrier for damages tor an assault by another passenger in a train, where the conductor, and later a trainman, saw and knew that the passenger who was complained of, Peters, threatened plaintiff and did him some little violence, yet took no measure to protect plaintiff. The trial court directed a verdict for the defendant. In reversing and ordering judgment for the plaintiff, the Massachusetts Supreme Court said that a railroad company is not obliged to foresee the impossible or highly improbable, and it is not called upon under ordinary circumstances to expect that one passenger will assault another; or that because one passenger is engaged in frolic or sport with another, such conduct will result in injury to one of them. But where the circumstances and surroundings, conduct, speech or manner of one passenger toward another is such that violence or harm is likely to result, and the carrier has reasonable notice of such circumstances and conduct, and has the opportunity to take measures to prevent the threatened violence, then it becomes its duty to protect the threatened passenger. The conductor's knowledge alone might not have been sufficient to indicate the recurrence of trouble; but when the trainman came upon the scene, knew the plaintiff's complaints and saw Peters' conduct and heard his speech and did nothing, it became a question for the jury whether the company complied with the obligation resting on it of using the highest degree of caution in looking forward to and preventing injury to passengers, from all sources, consistent with its undertaking. Lenberg v. New Haven (Mass.), 108 N. E. 1046.

Steamship Owned by Railroad—Status Under Federal and State Liability Acts

In an appeal from an award of the New York Workmen's Compensation Commission for the death of an employee of the Southern Pacific while unloading a steamship berthed alongside a pier in the Hudson river, the New York Court of Appeals was called upon to decide as to the applicability of the act to the facts of the case. The steamship was owned by the railroad and plied between New York and Galveston. It did not appear that it was in any way operated in connection with a line of railroad. The railroad contended that the federal employers' liability act applied, and not the State compensation act. The court held that, as far as the present case was concerned, the railroad was a carrier by water. The act applies only to carriers by railroad. There is nothing in it indicative of a purpose to apply it to carriage by water if such carriage happen to be conducted by a railroad corporation, and not otherwise—to apply one rule of liability to transportation by a steamship line, if owned and operated by a railroad corporation, and a different rule to precisely similar transportation not thus controlled. The federal act provides a rule of liability of carriers by railroad for injury or death resulting "by reason of any defect or insufficiency due to its negligence, in its cars, engines, appliances, machinery, track, roadbed, works, boats, wharves or other equipment." It was held that the words "boats" and "wharves" might be given due effect by applying them as adjuncts or auxiliaries to transportation by railroad. The employment in which the deceased was engaged was not governed by the federal statute and the workmen's compensation act applied to it. At the same time the court held the latter statute to be constitutional. Decided July 15, 1915.

Railway Officers

Executive, Financial, Legal and Accounting

Asa G. Chandler, vice-president of the Atlanta & St. Andrews Bay, has been elected president, with headquarters at Atlanta, Ga., succeeding A. B. Steele, resigned.

Benjamin S. Crow has been appointed assistant general counsel of the Oregon Short Line, with headquarters at Salt Lake City, Utah. He will assume his new duties on September 1.

B. F. Bush, chairman of the board and president of the Missouri Pacific and the St. Louis, Iron Mountain & Southern, at St. Louis, Mo., has been appointed receiver for both these roads.

Operating

Paul F. Keating, superintendent of the Breckenridge division of the Great Northern, at Breckenridge, Minn., has been transferred to the Willmar division, with headquarters at Willmar, Minn.

John Bose, assistant superintendent of the Louisville & Nashville, at Mobile, Ala., has been appointed superintendent of the Louisville division, with headquarters at Louisville, Ky., vice E. E. Snyder, deceased.

A. V. Burr, superintendent of the Pullman Company at Houston, Tex., has been transferred in the same capacity to St. Louis, Mo., and H. J. Clark, district superintendent at New Orleans, La., succeeds Mr. Burr. Effective September 1.

E. M. Wrenne, assistant superintendent of transportation of the Nashville, Chattanooga & St. Louis, at Nashville, Tenn., has been appointed acting superintendent of transportation, succeeding to the duties of his father, M. J. C. Wrenne, deceased.

Joseph A. Caviezel, superintendent of the Alabama, Tennessee & Northern, at York, Ala., has been promoted to general superintendent, with headquarters at York, in charge of the operating and maintenance departments, and the office of superintendent has been abolished.

Traffic

R. J. Darnley has been appointed general agent of the Chicago, Burlington & Quincy, at Rockford, Ill., succeeding A. G. Everett, resigned.

William T. Price has been appointed commercial agent of the Union Pacific, with headquarters at Pueblo, Col., succeeding L. M. Tudor, assigned to other duties.

The jurisdiction of C. A. Fullen, general agent of the Chicago Great Western at Winnipeg, Man., has been temporarily extended to include the territory of the Fargo agency.

Thomas J. Kenniff has been appointed commercial agent of the Chicago, Milwaukee & St. Paul, with headquarters at Minneapolis, Minn., succeeding Truman H. Clark, resigned to engage in other business.

Omar Sanders, traveling freight agent of the Atlanta, Birmingham & Atlantic, at Birmingham, Ala., has been appointed commercial agent, with offices at Atlanta, Ga., vice Walter I. Middleton, granted leave of absence.

G. H. Corse, Jr., general passenger agent of the San Francisco Overland Routes, with headquarters at Yokohama, Japan, and Hongkong, China, has resigned to become special agent of the passenger department of the Union Pacific, with headquarters at Chicago.

The jurisdiction of the general freight agent of the First division, of the Atlantic Coast Line, has been extended to include all points north of the Savannah river. James F. Mead, assistant general freight agent at Jacksonville, Fla., has been appointed assistant general freight agent with office at Savannah, Ga., with jurisdiction in Georgia, Florida and Alabama, and his former position has been abolished. Robert Taylor, citrus fruit agent at Jacksonville, has been appointed division freight agent with office at Jacksonville.

E. W. Johnson has been appointed general dairy agent of the Merchants' Despatch (New York Central), with office at Chicago, and the position of general western agent has been abolished. G. B. Horr has been appointed western dairy agent, with office at Chicago, and the position of assistant general western agent has been abolished. S. D. Parkhurst has been appointed eastern dairy agent, with office at New York, vice E. E. Overpeck, deceased, and David P. Skinner has been appointed dairy agent, with office at Chicago, vice Mr. Parkhurst.

Purchasing

Edward J. Price, whose appointment as general storekeeper of the St. Louis & San Francisco, with headquarters at Springfield, Mo., has been announced, was born at Marion, Ill., on June 28, 1870. He was educated in the common and night schools and entered railway service on September 21, 1888, as messenger boy with the Union Pacific at Kansas City, Mo. He left the Union Pacific in June, 1891, and went to the Atchison, Topeka & Santa Fe, which road he remained with until November, 1913, when he was appointed traveling storekeeper of the St. Louis & San Francisco, from which position he is now promoted as above noted.

OBITUARY

Elmer E. Snyder, superintendent of the Louisville Division of the Louisville & Nashville, at Louisville, Ky., since 1902, died on August 4, at the age of 53.

Mendes Cohen, a former well-known railroad engineer, died at his home in Baltimore, Md., on August 13, at the age of 84. Mr. Cohen began his career in the locomotive works of Ross Winans at Baltimore. From 1851 to 1855 he was in the engineering department of the Baltimore & Ohio Railroad. From 1855 to 1875 he served the following companies as superintendent, assistant superintendent, controller or president: The Hudson River Railroad, the Ohio & Mississippi and the Philadelphia & Reading; the Lehigh Coal & Navigation Company, and the Pittsburgh & Connellsville Railroad. He was long president of the Maryland Historical Society, retiring only two years ago.

M. J. C. Wrenne, superintendent of transportation of the Nashville, Chattanooga & St. Louis, at Nashville, Tenn., died in that city on August 10. He was born in August 1847, at Limerick, Ireland, and began railway work in May, 1861, as a clerk in the superintendent's office of the Nashville & Decatur, now a part of the Louisville & Nashville. Since May of the following year, he had been in the continuous service of the Nashville & Chattanooga, and its successor, the Nashville, Chattanooga & St. Louis, having served consecutively as clerk in the transportation department, trainmaster, superintendent, and then as general superintendent until January, 1899, when he was appointed superintendent of transportation.

The Railway Accident Record of Australia.—The various Australian states come out well in the matter of railway accidents, the latest five years to which statistics extend showing an average of 0.10 fatalities per 1,000,000 passengers carried in New South Wales. The corresponding average in Victoria was 0.09 per 1,000,000 passengers, and in South Australia 0.11. In the United Kingdom the average was 0.08 per 1,000,000 passengers carried; in Germany, 0.08 per 1,000,000 passengers; in Austria, 0.08 per 1,000,000 passengers; in Hungary, 0.26 per 1,000,000 passengers; in Belgium, 0.09 per 1,000,000 passengers; in Sweden, 0.08 per 1,000,000 passengers; in Hungary, 0.26 per 1,000,000 passengers; in the Netherlands, 0.07 per 1,000,000 passengers, and in Switzerland, 0.12 per 1,000,000 passengers. In the United States the average came out at 0.51 per 1,000,000 passengers carried. The worst showing was, however, made in Russia in Europe, which figured with an average of 1.47 fatalities per 1,000,000 passengers, and Asiatic Russia with an average of 4.19 per 1,000,000 passengers. The number of persons injured per 1,000,000 passengers carried was 2.36 in New South Wales, 3.37 in Victoria, and 3.68 in South Australia. In the United Kingdom the average came out at 2.15 per 1,000,000 passengers, in Germany at 0.44, in Austria at 1.92, in Hungary at 1.24, in Belgium at 3, in Sweden at 0.25, in Norway at 0.16, in the Netherlands at 0.48, and in Switzerland at 0.93.—*Engineering, London.*

Equipment and Supplies

LOCOMOTIVE BUILDING

THE ATLANTIC COAST LINE has ordered 10 Pacific type locomotives from the Baldwin Locomotive Works.

THE NASHVILLE, CHATTANOOGA & ST. LOUIS has ordered 3 Mallet (2-8-8-2), 5 Mikado and 2 Pacific type locomotives from the Baldwin Locomotive Works.

THE WISCONSIN & NORTHERN has ordered 1 superheater ten-wheel type locomotive from the American Locomotive Works. This locomotive will have 20 by 26 in. cylinders; 63-in. driving wheels and a weight of 168,000 lb.

THE SOUTH DAKOTA CENTRAL has ordered one ten-wheel and one Mikado type locomotives from the American Locomotive Company. The ten-wheel locomotive will have 18 by 24 in. cylinders, 60-in. driving wheels and a total weight of 136,000 lb. The Mikado type locomotive will have 20 by 28 in. cylinders, 52-in. driving wheels and a total weight of 178,000 lb.

CAR BUILDING

THE VIRGINIA-CAROLINA is in the market for 120 30-ton box cars.

WELLS, FARGO & CO. are inquiring for 35 express refrigerator cars.

THE PENNSYLVANIA LINES WEST are in the market for 100 underframes for caboose cars.

THE PITTSBURGH & LAKE ERIE has ordered 20 underframes from the Merchants Despatch Transportation Company.

THE NEW YORK CENTRAL has ordered 500 50-ton all steel automobile cars from the Haskell & Barker Car Company for the Michigan Central.

THE ATLANTIC COAST LINE is in the market for two 74-ft. coaches, one 70-foot combination passenger and baggage cars and two 70-foot baggage and mail cars.

IRON AND STEEL

THE SOUTHERN has ordered 4,000 tons of rails from the Maryland Steel Company.

THE PHILADELPHIA & READING has ordered 8,000 tons of rails from the Pennsylvania Steel Company and 2,000 tons from the Bethlehem Steel Company.

THE WESTERN PACIFIC has ordered 164 tons of steel for four 75-ft. single track deck plate girder spans in California, from the American Bridge Company.

THE CHICAGO GREAT WESTERN has ordered 167 tons of steel for three 70-ft. through plate girder spans, from the American Bridge Company.

THE CHICAGO RAILWAYS COMPANY has ordered from the American Bridge Company 309 tons of steel for girders and tie rods for the Van Buren street tunnel.

THE DENVER UNION TERMINAL COMPANY has ordered 419 tons of steel for passenger, baggage and express subways at Denver, Colo., from the American Bridge Company.

THE CHICAGO & WESTERN INDIANA has ordered 2,650 tons of rails from the Illinois Steel Company and 3,500 tons of steel for track elevation bridges, from the Morava Construction Company.

THE HANKOW-SZECHUAN GOVERNMENT RAILWAY of China, Robert W. Hunt & Co., Pittsburgh, Pa., consulting engineers, will receive bids until September 25 for 845 tons of steel for eight bridges on the Hankow-Ichang section. Specifications may be obtained from Robert W. Hunt & Co., Pittsburgh, Pa., for $2.50.

Supply Trade News

It is reported that the French government is negotiating for the purchase of 6,000,000 white oak ties for railroad building in France.

The Walter A. Zelnicker Supply Company, St. Louis, has purchased the stock and good will of the Bintliff Supply Company (successor to Bintliff & Herb), who were engaged in a general railway, mill and factory supply business and specialized in railroad track tools.

W. K. Millsapps, southwestern representative of the Grip Nut Company, Chicago, with headquarters at Houston, Tex., died on August 6, at Houston. Prior to his connection with the Grip Nut Company he was for several years general storekeeper of the Sunset Central Lines.

Charles B. Ellis, assistant to J. L. Replogle, vice-president and general manager of the American Vanadium Company, with office in New York, has become associated with the Bartlett-Hayward Company, Baltimore. Mr. Ellis was for many years with the Cambria Steel Company.

The Virginia Bridge & Iron Co., Roanoke, Va., has opened a branch office in the First National Bank building, Denver, Colo., to cover the territory embraced in the states of Kansas, Colorado, Arizona, New Mexico and Utah. The office will be in charge of A. R. Peyton, who has been associated with the Virginia Bridge & Iron Co. for some years as contracting engineer.

The Mesta Machine Company, Pittsburgh, Pa., has recently received an order from James B. Ladd, consulting engineer, Philadelphia, for a 1,500 H. P. mill engine for the Broken Hill Proprietaries Company, Ltd, New Castle, N. S. W. The engine is for rolling mill service, and is to be of the heavy-duty tandem compound Corliss valve type. This engine, when installed, will make the fourth unit that the Mesta Machine Company has built for the Broken Hill Proprietaries Company.

Arthur M. Torry, for the past four years in charge of the soliciting department of Hildreth & Co., recently resigned from that position to take charge of the engineering contract department of W. S. Barstow & Co., New York. This company is engaged in engineering and construction work in various parts of the country, and also controls the General Gas & Electric and the Eastern Power & Light corporations, operating some 40 public utilities in the eastern and middle western states.

Joseph T. Ryerson & Son, Chicago, have recently completed a new warehouse on Westside avenue, Jersey City, N. J. The company has maintained an office at 30 Church street, New York, and a warehouse at Boonton for some time. The new plant in Jersey City will put it in a much stronger position for handling its iron, steel and machinery business in the New York district and the east in general. The warehouse is located on a ten-acre site at the junction of the Hackensack river and Newark bay, thus affording facilities for making water shipments to all parts of New York harbor and adjacent waters. The building is 350 ft. by 250 ft. and covers a ground area of 87,500 sq. ft.

The Bethlehem Steel Company has purchased the plant of the Detrick & Harvey Machine Company, Baltimore, Md. The directors of the latter have elected the following officers: A. D. Mixsell, president; W. F. Roberts, vice-president; J. W. Neidhardt, vice-president and general manager, B. F. Jones, secretary and treasurer, and F. A. Shick, auditor. Mr. Neidhardt, as vice-president and general manager, will be the local representative of the Detrick & Harvey Company at Baltimore. This company was formed in 1884 by John S. Detrick and Alexander Harvey, and these two occupied the positions of president and secretary and treasurer, respectively, until Mr. Harvey's death last November, when Curran W. Harvey, his son, succeeded his father. The company manufactures planers, horizontal drill-

ing and boring machines, vertical boring and turning mills and special machinery. It will continue to engage in this business.

The Harrisburg Water Laboratories have been organized for the chemical and bacteriological examination of water, sewage, trade wastes and other associated substances. The organization consists of Lesley McCreath, junior member of the firm of Andrew S. McCreath & Son, analytical and consulting chemists, Harrisburg, Pa., who still retains his interest in said firm; Dr. George R. Moffitt, city chemist and bacteriologist, pathologist to the Harrisburg Hospital and head of the Moffitt Bacteriological Laboratory, and Farley Gannett, consulting engineer and late engineer of the Water Supply Commission of Pennsylvania. The laboratories are equipped and prepared to test and analyze samples of the above substances, submitting reports with interpretation of same.

The New York Air Brake Company, on August 18, declared the regular quarterly dividend of 1½ per cent. Following the meeting President Charles A. Starbuck made the following statement: "In addition to its regular business the company has undertaken orders for high explosive shells and cartridge cases aggregating $16,581,500 for delivery within the next twelve months, on which substantial payments have been made and in which there is no cancellation clause. The orders taken are for material which is simple to manufacture, and deliveries already have commenced and are giving satisfaction. The company is fully equipped to take on large additional orders for high explosive shells and cartridge cases, and negotiations are pending which are likely to result in large additional business running into 1917."

The United States Circuit Court of Appeals for the seventh circuit has just handed down a unanimous opinion in the suit of the Q & C Co. against Otto R. Barnett and the P & M Co., affirming the decision rendered last April by Judge Sanborn of the United States District Court for the Northern District of Illinois, Eastern Division, sustaining the exclusive selling contract of the Q & C Co. for the Vaughan rail anchor and enjoining the P & M Co. from selling the same anchor. This decision is based upon a contract of April 30, 1907, between the Q & C Co. and the parties controlling the patents for the Vaughan rail anchor, granting the former company the exclusive sales rights. The owners of these patents gave a selling license to the P & M Co. on April 1, 1915. In this decision this license is declared void.

TRADE PUBLICATIONS

Track Supplies.—The Track Specialties Company, New York, has issued a book containing simple rules for the computation of shortened switch leads and rules for the location of derailers. This book also contains information and illustrations of the various track accessories made by this company.

Drag-Line Bucket.—The Brown Hoisting Machinery Company, Cleveland, Ohio, has issued a booklet describing the Brownhoist-Shnable drag-line bucket which it is now making. This book shows a number of photographs of this bucket in actual service and gives considerable data concerning its performance.

Bumping Posts.—The Railway & Traction Supply Company, Chicago, has issued a pamphlet showing illustrations of its Hercules steel bumping posts, 39 of which were installed by the United States government at the ends of the towing tracks used by the electric towing engines at the locks along the Panama canal.

Gasolene Motor Cars.—The McKeen Motor Car Company, Omaha, Neb., has issued a new booklet describing its various types of railway motor cars and also a new highway motor car with rubber-tired wheels for street and road service and with railroad flanged wheels for operation on urban railroad lines. This car has a seating capacity of 27 and a new spring pneumatic cushion chair for every passenger. The booklet also describes this company's new 300-hp. motor car for railway service containing a 70-ft. post office compartment and express and baggage compartments. It is designed to pull a standard steel railroad coach for passengers, with a capacity to supersede locomotive train service consisting of five units, locomotive, tender and three cars.

Railway Construction

Atlantic Coast Line.—This company has under consideration plans for the construction of a line, it is said, from St. Stephen, S. C., southwest via. Ridgeville and Walterboro to Yemassee, about 75 miles.

Canadian Roads Electric.—Engineers of the Hydro-Electric Power Commission of Ontario are now at work south of Hamilton surveying for an electric line from Hamilton to Port Dover and other points on Lake Erie. The plans call for building also to St. Catherines and all intermediate points, including a branch line to Dunnville and Cayuga. F. Gaby, Toronto, Ont., chief engineer of the Hydro-Electric Power Commission. (October 30, p. 818.)

Chattanooga Traction.—This company is planning to build an extension, it is said, from Chattanooga, Tenn., north to Hixson, about 8 miles. The company now operates a line from Chattanooga to Signal Mountain.

Cleveland & Ohio Central Electric.—The amended articles of incorporation changing the name of the Cleveland, Barberton, Coshocton & Zanesville to the Cleveland & Ohio Central Electric, which have been filed, provide also for changing the route authorized under the charter from Cleveland, Ohio, to Zanesville, through Barberton and Coshocton to a line running from Cleveland to Wooster, through Brooklyn, Parma and Royalton townships in Cuyahoga county, and Kinckley, Granger, Sharon and Wadsworth townships in Medina county, and Milton, Chippewa, Green, Wayne and Wooster townships, in Wayne county, through the towns of Sharon, Wadsworth, Rittman and Smithville and into the town of Wooster.

Cleveland, Barberton, Coshocton & Zanesville.—See Cleveland & Ohio Central Electric.

Fairmont Helen's Run.—See Western Maryland.

Maine Roads (Electric).—The question of building 33 miles of electric line in Maine is now under consideration, it is said. The projected route is from Topsham, Me., north to Monmouth. F. B. Teeling, Litchfield, Me., is interested.

New York Subways.—The New York Public Service Commission, First district, has given to the Dock Contractor Company, the lowest bidder, for $1,692,370, the contract for building Section No. 2 of Route No. 29. This section is to be a two-track subway under Nostrand avenue, from Church to Flatbush avenues, in the borough of Brooklyn. (July 30, p. 219.)

Oregon Roads.—Plans are being made by Kendall Brothers, Pittsburgh, Pa., to build a line from Roseburg, Ore., north to Umpqua, about 30 miles. The City of Roseburg will issue $300,000 of bonds, the proceeds of which are to be used in aid of the project.

Pacific & Idaho Northern.—A public meeting was held recently at New Meadows, Idaho, and resolutions were adopted favoring the construction of a new north and south railroad between New Meadows, Idaho, and Lewiston, or the construction of an extension of the Pacific & Idaho Northern, from New Meadows north to Lewiston, about 120 miles.

Petersburg & Appomattox (Electric).—A contract has been let to the Vaughan Construction Company, Incorporated, of Shawsville, Va., and Roanoke, it is said, to build the electric line from Petersburg, Va., northeast to City Point, about 12 miles. The construction work is to be finished by February, 1916. (April 2, p. 767.)

Rapid Transit Company of Illinois.—Incorporated in Illinois with $100,000 capital and headquarters at East St. Louis, Ill. The plans call for building an interurban line from East St. Louis southeast, via Chester, Murphysboro and Carbondale, and northeast through the coal fields. J. Vonnahme, D. P. Roberts, C. B. Vonnahme and M. Harned, all of East St. Louis, and L. T. Hoeltman, Collinsville, are incorporators.

RICHMOND, RAPPAHANNOCK & NORTHERN.—Surveys are now being made and construction work is to be started soon, it is said, on a line from West Point, Va., northeast to Urbanna, 17 miles. The company was incorporated with $300,000 capital on July 30 by capitalists of Richmond, Va. Warner Moore, president; H. L. Lewis, O. J. Sands, C. Thompson and C. Wortham are said to be interested. This is an independent enterprise, and is not connected with the Richmond & Rappahannock River, which plans to build an extension to Urbanna in the near future.

RICHMOND & RAPPAHANNOCK RIVER.—See Richmond, Rappahannock & Northern.

ROLLA, OZARK & SOUTHERN.—This company will build a line from Rolla, Mo., on the St. Louis & San Francisco, to Anutt, a distance of about 18 miles. There will be one bridge across Dry Fork Creek. About one-third of the work has been completed. J. Ellis Walker, Rolla, Mo., is secretary of the company.

SOUTHERN OREGON TRACTION COMPANY.—This company has taken over the Rogue River Valley Railway, which operates about six miles of line between Medford and Jacksonville, Ore., and will electrify it. A portion of the overhead equipment has been purchased. The line at present is operated by gasolene motor cars and steam locomotives.

WESTERN MARYLAND.—The route of the line now being built under the name of the Fairmont, Helen's Run, is from a connection with the Baltimore & Ohio near Chiefton, Marion County, W. Va., in a general northernly direction, crossing West Fork river, thence up Helen's Run to Ida May shaft, with a spur line up Martin's Run to Carolina shaft. The grading contract was let recently to A. L. Anderson Brothers, Altoona, Pa., and bids are now being asked for the steel on bridges, including one steel structure 560 feet long. There will also be five trestles on the line, and a storage yard is to be constructed at Chiefton. Most of the construction will be side hill work; the line is to be built through a mountainous country. The maximum grade to mines will be 1.8 per cent. and maximum curvature 12 degrees. (August 13, p. 301).

RAILWAY STRUCTURES

ALGIERS, LA.—Work has been started on the substructure of the new shops to be built at Algiers for the Morgan's Louisiana & Texas Railroad & Steamship Company. The cost of the improvements will be about $250,000. (May 28, p. 11140.)

CHICAGO, ILL.—The Chicago & North Western has awarded a contract for the substructure of the bridge over the north branch of the Chicago River south of the Deering station to the Great Lakes Dredge & Dock Company, Chicago. A new interlocking plant will also be built.

DALLAS, TEX.—The city commission has engaged John F. Wallace, of Chicago, to make a survey looking to extensive grade crossing elimination and to prepare a program. The proposed improvements will involve an expenditure of several million dollars. The railroads entering Dallas are now building a new union station, which, with other improvements, will cost about $5,000,000.

OELWEIN, IOWA.—A fire on August 2 destroyed the store house of the Chicago Great Western at this place, and most of the contents. The estimated loss is $75,000. Plans are now being prepared for a new structure.

PITTSBURGH, PA.—A contract has been let for building a combined freight house and storehouse for the Pittsburgh & Lake Erie, in Pittsburgh. The new building will be of steel, brick and concrete construction, 188 ft. by 320 ft., and seven stories high.

WEST TULSA, OKLA.—The St. Louis & San Francisco has awarded a contract to Fairbanks, Morse & Co. for a concrete conveyor type coaling and sanding station, to be erected at this place.

WILLOW SPRINGS, MO.—The St. Louis & San Francisco has awarded a contract to Fairbanks, Morse & Co. for a large capacity concrete conveyor type coaling and sanding station, to be erected at this place.

Railway Financial News

CANADIAN NORTHERN.—Wm. A. Read & Co., New York, have bought from the Canadian Northern and have sold to the public, at 98⅝, $11,500,000 two-year 5 per cent collateral notes dated September 1, 1915. At this price the notes yield about 5.75 per cent on the investment. These notes are secured by the deposit of $15,333,334 Canadian Northern general mortgage 4 per cent bonds due 1934. The Dominion Government unconditionally guarantees both principal and interest of the pledged bonds. The notes are convertible at par into bonds at 85 on or before maturity.

CHICAGO, ROCK ISLAND & PACIFIC.—The receivers have asked the court for permission to abrogate the lease under which the Keokuk & Des Moines is operated.

KANSAS CITY, VIADUCT & TERMINAL.—The first mortgage 4½ per cent bonds protective committee proposes to extend the protective agreement which expires by limitation January 1, 1916, for a period of two years, within which time the committee expects to find a purchaser for the property. The committee consists of William C. Lane, R. Walter Leigh, Lawrence E. Sands, Richard C. Storey, with William C. Dooley, secretary.

KEOKUK & DES MOINES.—See Chicago, Rock Island & Pacific.

LAKE ERIE & PITTSBURGH.—Authority has been received from the Ohio Public Utilities Commission to issue $3,540,000 first mortgage 5 per cent refunding bonds to be guaranteed by the Pennsylvania and New York Central.

MACON (GA.) TERMINAL CO.—The company has sold $1,600,000 of an authorized issue $3,000,000 first mortgage 5 per cent bonds of July 1, 1915-1965. These bonds are guaranteed principal and interest jointly and severally by the Central of Georgia, the Georgia, Southern & Florida, and the Southern Railway. The terminal is to be used as a union passenger station, for which the three roads will pay rental on a wheelage basis.

MISSOURI PACIFIC.—B. F. Bush, president, has been appointed receiver of the Missouri Pacific and of the St. Louis, Iron Mountain & Southern.

NEW YORK, NEW HAVEN & HARTFORD.—Counsel for the directors who have been accused by the Government of violating the Sherman Anti-Trust Law have asked Judge Hunt to direct the Government to give more details in its bill of particulars, claiming that the Government was holding back important evidence to be used as a surprise against the accused directors.

PITTSBURGH, SHAWMUT & NORTHERN.—The New York State Public Service Commission has authorized Frank Sullivan Smith, receiver, to issue $1,700,000 certificates of indebtedness, bearing interest at 6 per cent. and running for two years. The issue has been authorized by the Supreme Court of New York State and the United States District Court, for the Western District of Pennsylvania. The new certificates will be used solely for exchange at par for certificates outstanding which mature on August 1 and September 1. The older certificates have paid 5 per cent.

ST. LOUIS, IRON MOUNTAIN & SOUTHERN.—See Missouri Pacific.

ASIA MINOR RAILWAYS.—Press despatches report that the Turks have begun to construct a railway line in hot haste between Zungdulduk, on the Black sea—the coal port which has been repeatedly shelled by the Russians—and Ada Bazar, a town near the head of the Gulf of Ismid, in the Sea of Marmora. This is for the purpose of transporting coal owing to the difficulties of doing so by sea. Five thousand Greeks and Armenians are engaged on the work, under the supervision of German engineers and surveyors. Another line is being constructed from Angora, on the Bagdad Railway, in Anatolia, towards Erzerum, in Armenia—over 300 miles. So far about 7 miles have been laid. These works have been paid for by moneys taken from the agriculture banks.

[ADVERTISEMENT.]

ANNUAL REPORT

THIRTIETH ANNUAL REPORT OF THE BUFFALO, ROCHESTER & PITTSBURGH RAILWAY COMPANY

The Directors of the Buffalo, Rochester and Pittsburgh Railway Company submit to the Stockholders the following report for the year ending June 30, 1915:

ROAD OPERATED.

	1915. Miles.	1914. Miles.	Increase. Miles.
Owned	367.06	367.06	
Leased	89.90	89.90	
Trackage rights	129.52	129.52	
Total length of road operated	586.48	586.48	
Second track	208.33	207.32	1.01
Sidings	372.71	360.48	12.23
Total miles of tracks, all steel rails	1,167.52	1,154.28	13.24

The tracks were increased by 1.01 miles of second track, constructed at Creekside, Pa., and 12.23 miles of new sidings.

INCOME.

Operating Income:	1915.	1914.	Increase or Decrease.
Revenues	$9,479,935.75	$10,734,691.00	—$1,254,755.25
Expenses	6,935,252.30	7,965,117.27	—1,029,864.97
Net revenue	$2,544,683.45	$2,769,573.73	—$224,890.28
Tax accruals	230,000.00	234,000.00	—4,000.00
Uncollectible revenues	596.27	.....	596.27
	$230,596.27	$234,000.00	—$3,403.73
Income	$2,314,087.18	$2,535,573.73	—$221,486.55
Miscellaneous income	450.48	Dr. 362.89	813.37
Total operating income	$2,314,537.66	$2,535,210.84	—$220,673.18
Non-operating income	718,195.23	820,587.10	—102,391.87
Gross income	$3,032,732.89	$3,355,797.94	—$323,065.05
Deductions for Interest and Rentals	2,120,013.33	2,001,013.78	118,999.55
Net income	$912,719.56	$1,354,784.16	—$442,064.60
Appropriations:			
Pension and Fire Insurance Funds	21,508.47	16,432.49	5,075.98
Special appropriations	111,211.09	348,351.67	—237,140.58
Total Appropriations:	$132,719.56	$364,784.16	—$282,064.60
Surplus available for dividends.	$780,000.00	$990,000.00	—$210,000.00

A special appropriation of $111,211.09 was made from Net Income, being part of the $125,000 paid into the Sinking Funds under Equipment Agreements Series A, B and C, out of which $45,797.26 was applied to retire $46,000 of Eqipment Bonds Series C, and the balance was reserved for the purchase of new rolling stock.

Profit and Loss account was charged with $536,380.61. Of this amount $14,284.45 is the remaining part of the payments into the above mentioned Sinking Funds, including accrued interest, and is also available for the purchase of new rolling stock; $216,298.83 represents the cost of Equipment bonds Series D, E and F paid off during the year, less one-half of the principal refunded by 4½% Consolidated Mortgage bonds held in the Treasury of the Company; $180,797.33 covers the full amount paid into the Sinking Funds, including accrued interest, to retire bonds under Equipment Agreement Series G; and $125,000 is the principal of Series H bonds paid off during the year.

DIVIDENDS.

Dividends in cash were paid on:

		1915.	1914.
Preferred stock	$6,000,000	6% $360,000	6% $360,000
Common stock	10,500,000	4% 420,000	6% 630,000
Total	$16,500,000	$780,000	$990,000

Since the close of the fiscal year, your Board of Directors has declared semi-annual dividends of three per cent. on the preferred stock and two per cent. on the common stock, payable August 16, 1915.

CAPITAL STOCK.

There has been no change during the year in this account. The total outstanding Capital Stock of the Company amounts to $16,500,000, and consists of $6,000,000 preferred stock and of $10,500,000 common stock.

FUNDED DEBT.

In accordance with the provisions of the Consolidated Mortgage of 1907, $1,020,000.00 4½% bonds were received from the Trustee to apply on payments made for improvements and betterments, and the securities placed in the Treasury of the Company. The Trustee also delivered to the company $205,000.00 Consolidated Mortgage 4½% bonds, representing 50% of Equipment Bonds, Series D, E and F, retired during the year.

These bonds, added to those in the Treasury of the Company, made a total of $2,400,000.00, of which $1,000,000.00 were sold during the year for corporate purposes, leaving a balance of $1,400,000.00 held in reserve.

Under the terms of the Sinking Funds for the redemption of Equipment Bonds, $640,000.00 were retired, as follows: $46,000.00 Series C; $115,000.00 Series D; $117,000.00 Series E; $178,000.00 Series F; and $184,000.00 Series G.

Also the first annual installment of $125,000.00 Series H bonds was paid, as provided for in that Equipment Agreement.

The net result is an increase of $235,000.00 in the bonded debt of the Company, outstanding on June 30, 1915.

COST OF ROAD.

Capital account has been charged during the year with $882,008.80 for investment in road, as follows:

Lands for yard tracks, Rochester, N. Y.	$121,617.64
Other lands	4,639.65
Storage warehouse, Rochester, N. Y.	163,318.88
Subway, Saxton St., Rochester, N. Y.	24,931.36
Elimination of grade crossing, Scottsville, N. Y.	23,431.00
Increased weight of rails, frogs and fastenings	64,856.87
Stone ballast	18,459.05
Improving bridges and culverts	80,272.97
Automatic block signals	70,641.45
Power plant building and machinery, Du Bois, Pa.	128,711.00
Power transmission and distribution system, Du Bois, Pa.	27,954.35
Shop machinery	16,453.94
New station, Sykes, Pa.	6,237.88
Yard extensions, sidings, etc	130,482.76
Total	$882,008.80

The six-story concrete storage warehouse at Rochester, N. Y., referred to in last year's report, was completed and is now in operation.

Automatic electric block signals were installed between Buffalo Creek, N. Y., and Ashford, N. Y., a distance of 45 miles, making 139.64 miles of single track and 137.68 miles of double track, a total of 277.32 miles, under this system, being 47% of the entire main line mileage of the road.

The new power house at Du Bois Shops, Pa., was completed April 1, 1915. It accommodates new electric machinery now furnishing sufficient power to meet the growing needs of the plant at that point.

A new station was constructed at Sykes, Pa.

Among the important work still in progress may be mentioned:

Subway, Saxton Street, Rochester, N. Y.
Strengthening of steel bridges.
Replacing of timber bridges, trestles and culverts in permanent form.

COST OF EQUIPMENT.

Expenditures were made for new rolling stock as follows:		
Seventeen locomotives		$407,639.91
Five hundred steel underframe box cars		433,145.32
Five hundred steel underframe gondola cars		454,630.33
One locomotive crane hoist		7,524.80
Steel underframes applied on two thousand two hundred and twenty-four freight cars		149,542.13
Steel side stakes applied on one thousand eight hundred and fourteen freight cars		26,840.86
Sundry other betterments, including re-classification or transfer of three passenger cars and eighty-four freight cars		122,958.18
There was credited for equipment sold, transferred or destroyed, the following values, charged in part to Operating Expenses, and the balance representing the depreciation since June 30, 1907, charged to Accrued Depreciation account:		
Seven passenger train cars	$59,838.99	
Nine hundred and ninety-eight freight train cars	472,970.63	
Ten work equipment cars	4,374.62	
		537,184.24
Making a net increase of		$1,065,097.29

The total tractive power of engines aggregates 11,627,535 pounds, an increase of 984,280 pounds over last year.

The average tractive power of each engine increased 1,217 pounds, being 35,999 pounds as against 34,782 pounds last year.

The total carrying capacity of cars in freight service now amounts to 751,531 net tons, an increase of 14,033 tons over last year.

The average carrying capacity or efficiency of each freight car increased .90 ton, being 43.19 tons, as against 42.29 tons last year.

The reserve for accrued depreciation of equipment on June 30, 1915, is as follows:

On equipment owned	$2,149,524.00	
On leased equipment	203,377.98	
Total		$2,352,901.98

PASSENGER REVENUES.

The gross passenger revenue amounted to $1,101,980.50, a decrease of 6.96 per cent., or $82,436.49, caused chiefly by the shrinkage of local travel in the mining regions.

The average rate received per passenger per mile increased .057 cent, being 2.186 cents, as compared with 2.129 cents a year ago.

The average distance each passenger was carried decreased .07 mile, being 26.94 miles, against 27.01 miles last year.

Passengers carried in 1915	1,871,322	
Passengers carried in 1914	2,059,683	
A decrease of 9.15 per cent., or		188,361
Passengers carried one mile in 1915	50,415.391	
Passengers carried one mile in 1914	55,632,097	
A decrease of 9.38 per cent., or		5,216,706

FREIGHT REVENUES.

The average rate received per ton per mile increased .15 mill, being 4.77 mills, as compared with 4.62 mills last year.

The average distance each ton was hauled decreased 7.21 miles, being 153.83 miles, against 161.04 miles a year ago.

The revenue tonnage moved was as follows:

	1915.	1914.	Increase.	Decrease.
Bituminous coal	7,107,857	8,176,430		1,068,573
Coke	362,403	393,358		30,955
Iron ore	417,178	699,702		282,524
Pig and bloom iron	258,461	265,521		7,060
Other freight	2,782,136	2,760,038	22,098	
Total	10,928,035	12,295,049		

A decrease of 11.12 per cent., or		1,367,014
Tons moved one mile in 1915	1,681,022,418	
Tons moved one mile in 1914	1,980,012,951	
A decrease of 15.10 per cent., or		298,990,533

The result for the year is a loss of 12.36 per cent., or $1,131,251.63 in gross freight revenue.

Coal and coke traffic decreased 1,099,528 tons, or 12.83%, due to the disturbed business conditions in the territory served by your shippers.

The depression in the iron and steel industry existing throughout the year, caused a reduction of 289,584 tons, or 30.00% in iron ore, pig and bloom iron.

Other freight shows a slight increase.

The decision of the Interstate Commerce Commission, granting an increase of not over five per cent. in freight rates, became effective at various dates after December 16th, 1914. This did not apply to coal, coke, iron ore and other specified commodities. A careful estimate indicates that such increases added about 41,000 to our revenues this year.

EXPENSES.

Operating Expenses decreased $1,029,864.97, or 12.93 per cent., in which each primary expense account participated, as follows:

	Decrease.	Per Cent.
Maintenance of way	$180,698.99	12.48
Maintenance of equipment	80,839.83	3.65
Traffic	8,786.70	5.84
Transportation	735,562.36	18.96
Miscellaneous operations	12,396.13	45.82
General	11,580.96	4.76
Total	$1,029,864.97	12.93

The reduction of train mileage was a large factor in accomplishing the above decrease, but the increased efficiency resulting from previous improvements, and the enforcement of economies wherever practicable, contributed their share to the saving made. In attaining this result the Company did not depart from its policy of maintaining roadway and equipment at its usual high standard.

The operating ratio decreased 1.04 per cent., being 73.16 per cent., against 74.20 per cent. last year.

The percentage of each group of operating expenses to operating revenues for the past five years, is as follows:

	1915.	1914.	1913.	1912.	1911.
Maintenance of way	13.17	13.49	14.23	12.52	12.57
Maintenance of equipment	22.53	20.65	19.74	18.94	19.35
Traffic	1.50	1.40	1.30	1.26	1.44
Transportation	33.17	36.15	32.71	32.88	32.11
Miscellaneous operations	.15	.25	.....	.....	.....
General	2.44	2.26	2.05	2.14	1.81
Total	73.16	74.20	70.03	67.74	67.28

The average cost per ton per mile is 3.21 mills, being .02 mill less than last year.

The average number of revenue tons carried one mile per revenue freight train mile, excluding the mileage of helping engines, increased 13.56 tons, being 707.16 tons, against 693.60 tons a year ago.

The average number of revenue tons carried one mile per revenue freight engine mile, including the mileage of helping engines, increased 23 tons, being 477, against 454 a year ago.

The averages for the past ten years are as follows:

Year.	Train Load.	Engine Load.
1906	525	418
1907	543	435
1908	530	371
1909	597	400
1910	638	420
1911	635	430
1912	647	439
1913	710	462
1914	694	454
1915	707	477

The average number of revenue passengers carried one mile per revenue passenger train mile is 37, being 3 less than last year.

The non-revenue traffic, not included in any of the other figures of this report, is as follows:

	1915.	1914.
Number of passengers	275,504	323,726
Number of passengers carried one mile	11,522,375	13,098,629
Number of tons	867,023	1,106,032
Number of tons carried one mile	83,299,093	108,941,868

FIRE INSURANCE FUND.

The assets of this fund were increased $1,468.03 during the year, and now amount to $283,975.50 in interest-bearing securities and cash.

PENSION FUND.

The assets of this fund, created July 1, 1903, were increased $9,623.70 during the year, and now amount to $207,199.62 in interest-bearing securities and cash.

There were sixty-one pensioners upon the roll on June 30, 1915, a net increase of four during the year.

GENERAL REMARKS.

The Ontario Car Ferry Company, Limited, paid a dividend of 5 per cent for the year ending December 31, 1914. The sum of $12,485 received on the $249,700 of this Company's stock was credited to Non-operating Income account.

The second boat under construction for the Ferry Company, referred to in last year's report, is to be delivered about September 1st, next.

On November 16, 1914, Mr. O'Donnell Iselin was elected a Director to fill the vacancy in the Board caused by the resignation of Mr. Lewis Iselin.

Comparative statements and statistics of the operation of your road for the year, in which the figures for the preceding year were recast as far as possible to agree with the new Classification prescribed by the Interstate Commerce Commission effective July 1, 1914, are submitted herewith.

The acknowledgments of the Board are renewed to the officers and employees for their faithful and efficient services.

By order of the Board,

WILLIAM T. NOONAN,
President.

ROCHESTER, N. Y., July 31, 1915.

PROFIT AND LOSS ACCOUNT.

June 30, 1915.

CREDIT.

By Balance Surplus, June 30, 1914		$3,964,008.29
By Unrefundable overcharges		2,159.90
MISCELLANEOUS CREDITS.		
Adjustment of old accounts	$15.03	
Unclaimed wages, etc	2,280.25	
Discounts on funded debt retired	7,563.75	
Unreleased premiums on funded debt retired	202.22	
		10,061.25
Total		$3,976,229.44

PROFIT AND LOSS ACCOUNT—(*Continued*)

DEBIT.

To appropriation for new rolling stock under Equipment Agreements Series A, B and C, the balance being appropriated from Net Income	$14,284.45	
Appropriation for retiring bonds, under Equipment Agreements Series D, E, F, G, and H	522,096.16	
Premium on funded debt retired	6,596.25	
Loss on retired road	3,140.31	
MISCELLANEOUS DEBITS.		
Adjustment of old accounts	$197.01	
Abandoned surveys	8,930.32	
	9,127.33	
Total		555,244.50
By Balance Surplus, June 30, 1915		$3,420,984.94

COMPARATIVE INCOME ACCOUNT.

OPERATING REVENUES.

	1915.	1914.	INCREASE OR DECREASE.
FREIGHT—			
Coal	$5,040,100.92	$5,904,105.54	—$864,004.62
Coke	318,637.93	338,339.13	—19,701.20
Merchandise	2,663,951.27	2,911,497.08	—247,545.81
Total	$8,022,690.12	$9,153,941.75	—$1,131,251.63
PASSENGER	1,101,980.50	1,184,416.99	—82,486.49
OTHER TRANSPORTATION—			
Excess baggage	9,907.05	9,344.93	$562.12
Parlor and chair car	10,983.75	12,923.45	—1,939.70
Mail	52,956.47	52,834.38	122.09
Express	100,237.62	101,076.18	—838.56
Other passenger train	5,128.79	3,645.13	1,483.66
Milk	21,352.80	16,732.63	4,620.17
Switching	88,437.02	93,138.59	—4,701.57
Special service	.....	2,596.00	—2,596.00
Total	$289,003.50	$292,291.29	—$3,287.79
INCIDENTAL—			
Dining and buffet	9,755.03	12,232.74	—2,477.71
Station, train and boat privileges	4,066.17	4,058.93	$7.24
Demurrage	10,439.55	21,866.00	—11,426.45
Ganson St. Docks	38,251.00	61,878.50	—23,627.50
Sundry sources	3,749.88	4,004.80	—254.92
Total	$66,261.63	$104,040.97	—$37,779.34
TOTAL OPERATING REVENUES	$9,479,935.75	$10,734,691.00	—$1,254,755.25

OPERATING EXPENSES.

Maintenance of way and structures	$1,267,253.94	$1,447,952.93	—$180,698.99
Maintenance of equipment	2,135,354.18	2,216,194.01	—80,839.83
Traffic	141,766.76	150,553.46	—8,786.70
Transportation	3,144,597.92	3,880,160.28	—735,562.36
Miscellaneous operations	14,658.25	27,054.38	—12,396.13
General	231,621.25	243,202.21	—11,580.96
TOTAL OPERATING EXPENSES	$6,935,252.30	$7,965,117.27	—$1,029,864.97
NET OPERATING REVENUE	$2,544,683.45	$2,769,573.73	—$224,890.28
TAX ACCRUALS	230,000.00	234,000.00	—4,000.00
UNCOLLECTIBLE REVENUES	596.27	.....	$596.27
OPERATING INCOME	$2,314,087.18	$2,535,573.73	—$221,486.55
MISCELLANEOUS OPERATING INCOME	450.48	Dr. 362.89	$813.37
NON-OPERATING INCOME—			
Hire of freight cars	446,058.22	561,079.12	—115,020.90
Rent from other rolling stock	11,131.46	.....	11,131.46
Rents—Joint facilities	156,280.94	165,011.18	—8,730.24
Rent—Miscellaneous	11,175.15	12,544.31	—1,369.16
Dividend on stocks owned	12,485.00	12,485.00	.....
Income from securities, loans and accounts	71,972.89	66,381.78	5,591.11
Release of premium on funded debt	9,018.57	3,402.71	5,615.86
Miscellaneous	73.00	Dr. 317.00	390.00
TOTAL NON-OPERATING INCOME	$718,195.23	$820,587.10	—$102,391.87
GROSS INCOME	$3,032,732.89	$3,355,797.94	—$323,065.05

DEDUCTIONS FROM GROSS INCOME.

RENTS—FOR LEASED ROADS—			
Allegheny & Western Railway	$272,000.00	$272,000.00	.....
Clearfield & Mahoning Railway	86,500.00	86,500.00	.....
Mahoning Valley Railroad	15,000.00	15,000.00	.....
	$373,500.00	$373,500.00	.....
For rolling stock other than freight cars	707.42	.....	$707.42
Joint facilities	289,917.11	298,005.03	—$8,087.92
Miscellaneous	16,898.70	16,883.87	14.83
Total rents	$861,023.23	$688.388.90	—$7,365.67
INTEREST ON FUNDED DEBT—			
First Mortgage Bonds—Roch. & Pitts. Rd	78,000.00	78,000.00	.....
Consol. Mort. Bonds—Roch. & Pitts. Rd	235,200.00	235,200.00	.....
General Mort. Bonds—B. R. & P. Ry	221,350.00	221,350.00	.....
Consol. Mort. Bonds—B., R. & P. Ry	431,177.50	343,915.00	$87,262.50
First Mortg. Bonds—L., P. & C. Rd	17,500.00	17,500.00	.....
Equipment Agreements	454,350.49	415,422.38	38,928.11
Total	$1,437,577.99	$1,311,387.38	$126,190.61
INTEREST ON UNFUNDED DEBT	1,412.11	1,237.50	174.61
TOTAL DEDUCTIONS FROM GROSS INCOME	$2,120,013.33	$2,001,013.78	$118,999.55
NET INCOME—	$912,719.56	$1,354,784.16	—$442,064.60

DISPOSITION OF NET INCOME.

APPROPRIATIONS—			
Pension Fund	$9,459.45	$6,623.14	$2,836.31
Insurance Fund	12,049.02	9,809.35	2,239.67
New Equipment	65,413.83	74,104.38	—$8,690.55
Retirement of Equipment bonds	45,797.26	274,247.29	—228,450.03
DIVIDENDS—			
PREFERRED STOCK—			
(No. 42) 3% on $6,000,000, payable August 15, 1914	180,000.00	180,000.00	.....
(No. 43) 3% on $6,000,000, payable February 15, 1915	180,000.00	180,000.00	.....
COMMON SOCK—			
(No. 29) 2% on $10,500,000, payable August 15, 1914	210,000.00	315,000.00	—105,000.00
(No. 30) 2% on $10,500,000, payable February 15, 1915	210,000.00	315,000.00	—105,000.00
Total Appropriation of Income	$912,719.56	$1,354,784.16	—$442,064.60
INCOME BALANCED TRANSFERRED TO PROFIT AND LOSS	.....	.....	.....